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AUTOMOTIVE INDUSTRIES

IN THIS ISSUE

The Automobile Industry That's Behind the Iron Curtain

Automotive Engineers Get More Economy Minded

Saving High Octane Gas with an Automatic Dual Fuel System

Special Methods for Painting Aluminum Buses

New Device for Testing Silicone Dampers

An Accurate Way to Determine Engine Oil Consumption

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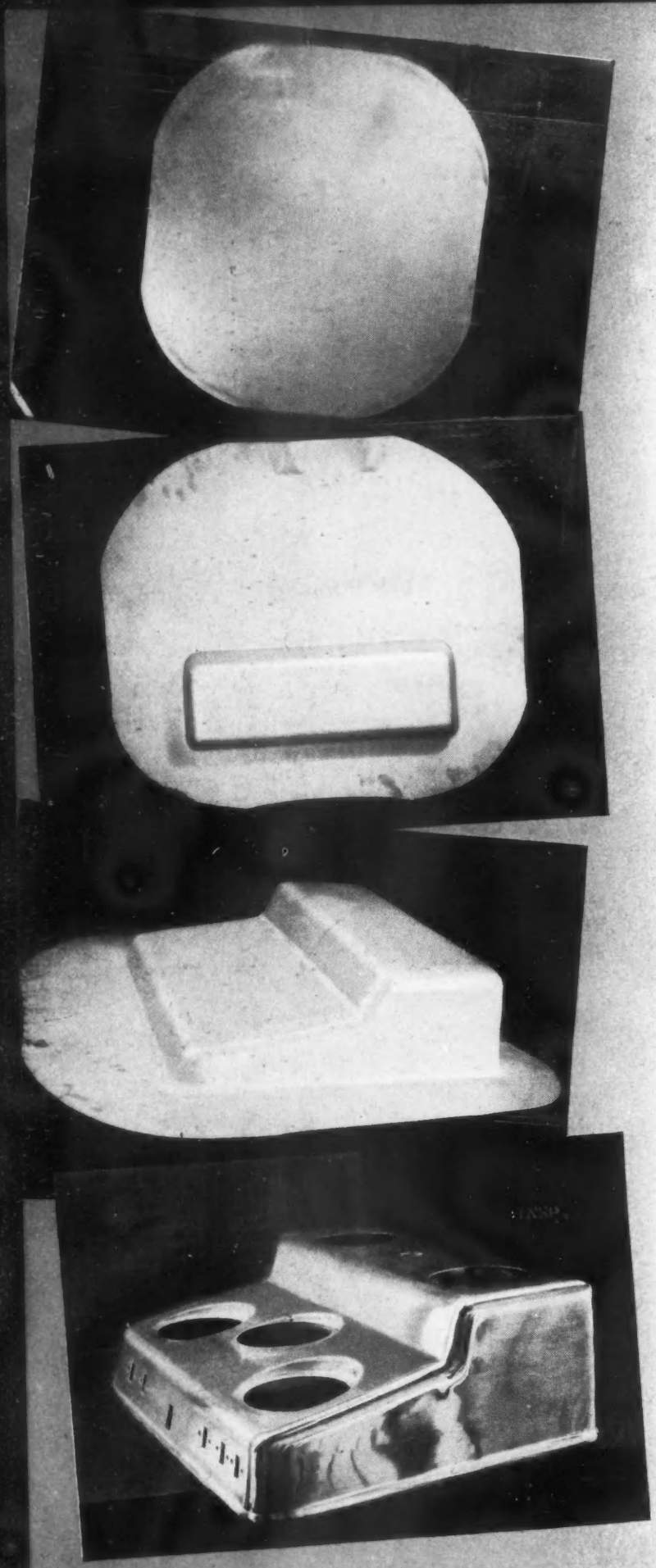

Solved!

...This Tough Draw on Stainless Steel

THE JOB

Drawing fountain body bases for automatic coffee makers from No. 304 stainless steel—thickness .050—9-inch draw. There are 13 steps in the operation as carried out at the Solar Aircraft Company, Des Moines, Iowa. Four major drawing steps are illustrated.

THE PROBLEM

The job was difficult because of the depth of draw and the complex structure—it was square with a step and taper on one side. The metal had to be held at certain points to prevent wrinkling, and at the same time it had to flow freely to prevent breaking and to obtain the required 35% metal in the corners.

THE SOLUTION

Solar Aircraft engineers, Standard Oil Technical Service Representatives and the Standard Oil Research Laboratory collaborated on the development of a new stamping compound and method of application.

THE RESULT

The finished part is free from structural weakness due to metal fatigue. Rejections have been reduced to a minimum. Die life has been excellent, and high production schedules have been obtained. The product possesses a highly satisfactory finish and appearance.

The Lubrication Engineering and Laboratory services of Standard Oil are available to any manufacturer in the Middle West who has a problem of metal drawing or machining operations. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Lubrication Engineer nearest you.

STANDARD OIL COMPANY (INDIANA)

STANDARD

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

February 1, 1948 Vol. 98, No. 3

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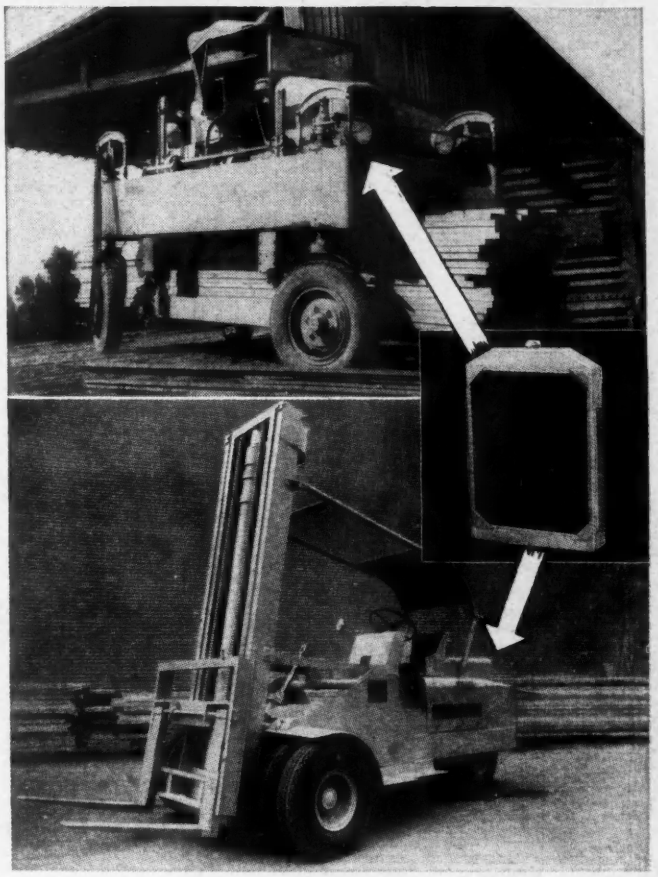
Designed for Specialized Automotive Equipment

YOUNG RADIATOR COMPANY — 20 YEARS OF SERVICE IN THE HEAT TRANSFER INDUSTRY — 1927 ★ 1947



● Specially designed Young radiators are meeting the unusual requirements of heavy-duty hauling and lifting on the unique equipment manufactured by Gerlinger Carrier Co., of Dallas, Oregon. Here Young gives an extra margin of heat transfer capacity to match the plus power of Gerlinger Units. Like Gerlinger, many manufacturers of specialized automotive equipment are using radiators designed by Young for their specific applications to gain the benefit of Young's two decades of designing and manufacturing experience in a vast variety of fields. Submit your present and future heat transfer problems to Young Engineers for free consultation.

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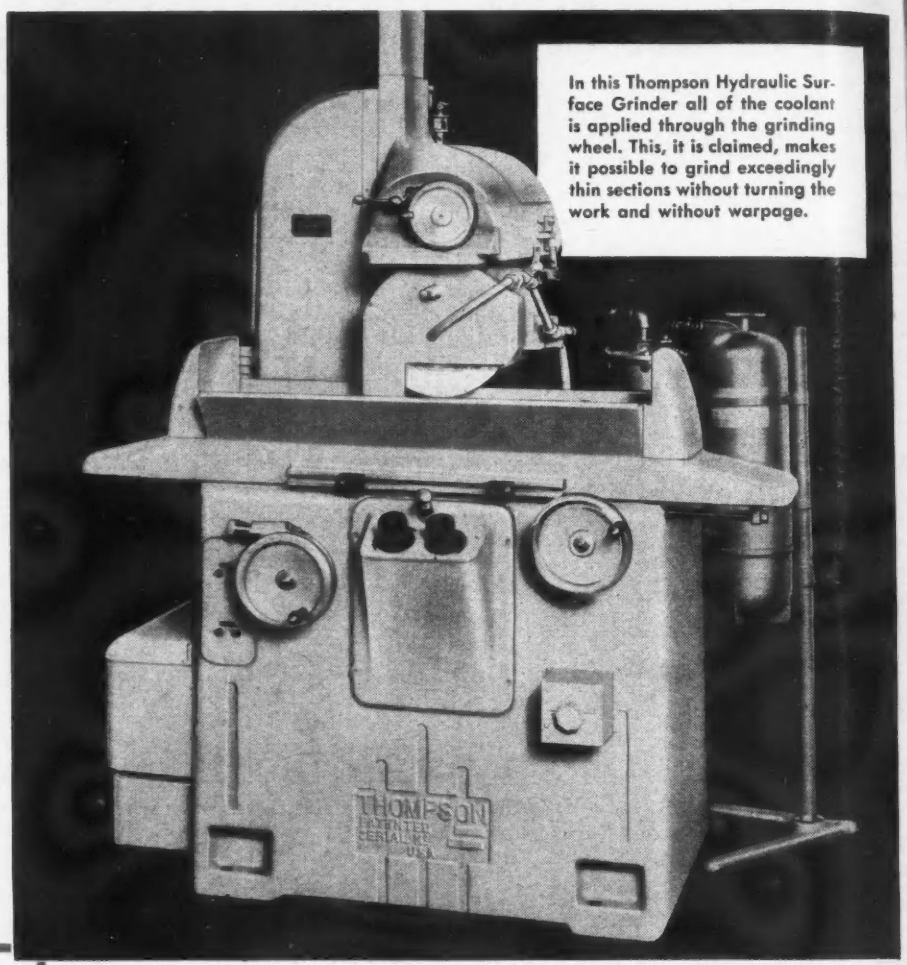
CAN HYDRAULIC SYSTEMS BE KEPT CLEAN?



In this Thompson Hydraulic Surface Grinder all of the coolant is applied through the grinding wheel. This, it is claimed, makes it possible to grind exceedingly thin sections without turning the work and without warpage.

Photo courtesy The Thompson Grinder Company

YES!

When you use oils especially made to prevent rust, sludge and foam — Texaco Regal Oils (R&O).

YOU benefit in many ways when you use *Texaco Regal Oils (R & O)* in your hydraulic systems. These fine, turbine-grade oils are especially inhibited against rust and oxidation, and processed to prevent foaming. Thus, they virtually eliminate the major causes of hydraulic system stoppages.

In addition, this ability of *Texaco Regal Oils (R & O)* to keep hydraulic systems clean greatly extends the time between necessary drains . . . saves many a costly repair bill . . . prevents production losses. You can get *Texaco Regal Oils (R & O)* in every needed viscosity.

Operators everywhere are enthusiastic about the exceptional results obtained with *Texaco Regal Oils (R & O)*. Leading hydraulic equipment manufacturers recommend these famous oils — and many ship their units already filled with them.

Let a Texaco Lubrication Engineer give you complete information. Just call the nearest of the more than 2500 Texaco Distributing Plants in the 48 States, or write:

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FOR ALL HYDRAULIC UNITS

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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

The Automobile Industry in Russia

Hampered by high overhead, waste, low worker productivity, raw materials shortage and tooling bottlenecks, production of motor vehicles under the USSR planned economy has been limited to a small number of trucks and a few passenger cars. What the Soviet automobile industry is doing to overcome these difficulties is told in a revealing and authoritative series of articles beginning in this issue on page 25.

New GM Supplier Plant

An interesting example of General Motors' decentralization is the new Brown-Lipe-Chapin plant in Elyria, Ohio. Part of a parent division located in Syracuse, N. Y., it manufactures hub caps, bumper guards and grilles. See Pages 28 and 29.

Engineers Becoming More Cost-Conscious

Economy was an important theme at the 1948 annual meeting of the SAE, held in Detroit recently, as evidenced by papers on the selection of steels for automotive applications, the use of low-alloy steels, and the more efficient utilization of motor gasoline. Complete news coverage of the meeting, together with abstracts of some of the papers, is given on pages 30-34.

Automatic Dual-Fuel System

Socony-Vacuum's answer to the high-octane gasoline problem of the experimental high-compression passenger car engine is an automatic dual-fuel system which would meter two grades of gasoline according to engine requirements. For complete details see pages 36 and 37.

Painting Aluminum Buses

Twin Coach has developed some special procedures and equipment for painting its aluminum buses. These are described in the article on pages 40 and 41.

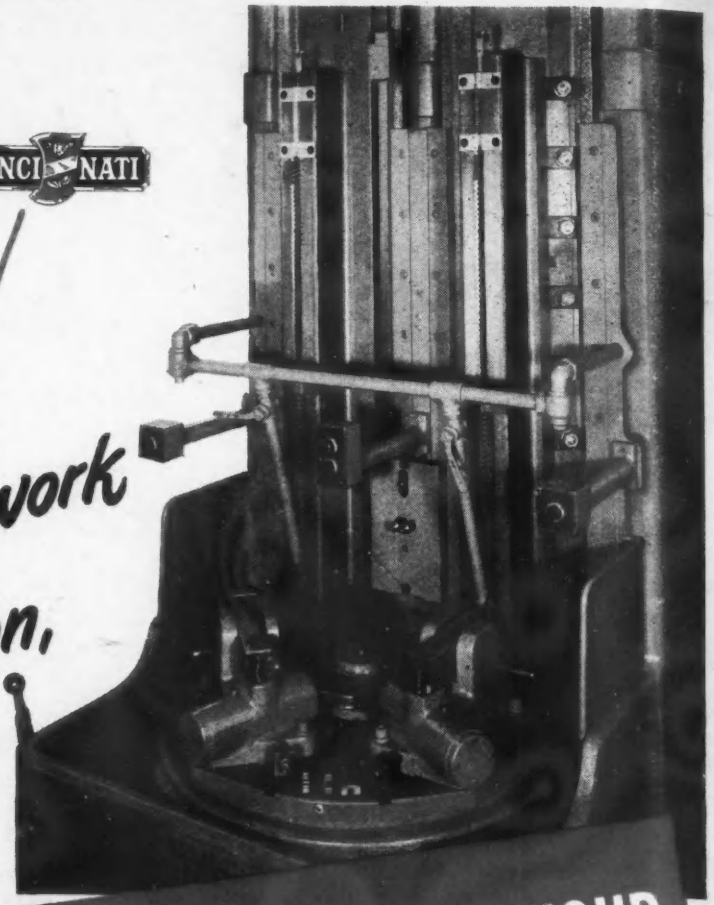
24 New Products Items And Other High Spots Such As:

An accurate method of determining engine oil consumption; Ford Motor Company's new cylinder block line for their six-cylinder truck engine; exhibits at the Motor Boat Show; a new device for testing torsional vibration dampers; pictures of the 1948 Cadillac; and new designs at the Materials Handling Show.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

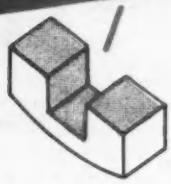
CINCINNATI No. 5-54 Vertical Duplex Hydro-Broach. Catalog No. M-1387-1. And a new publication is available, "How to Step Up Production with CINCINNATI Hydro-Broach Machines." Write for a copy of publication, M-1599.

CINCINNATI



It changes tiring work into production,

and BROACHES UP TO 800 PARTS PER HOUR



End view of part, showing broached surfaces in color. The four parts broached on this equipment are the same in all respects except the length.

Part name.....Bridge block
Material.....Extruded steel
Operation.....Broach Face, Slot and Chamfer
Production.....200 to 800 per hour, depending upon length

● Give a man a machine he can run without becoming dog tired and he'll show you some real production at lower costs. That's what Cincinnati Application Engineers had in mind when they devised the method and equipment shown here for broaching small steel blocks. ¶The machine is a CINCINNATI No. 5-54 Vertical Duplex Hydro-Broach, tooled up with fixtures having interchangeable clamping details which accommodate *four sizes of parts*. As the table swivels from one cutting position to the other, the work is automatically clamped and released. This arrangement eliminates most of the tiring work incident to operating the machine, and it gives the operator a fair chance to maintain production throughout the day. ¶CINCINNATI Hydro-Broach Machines and application engineering form a combination which you can't afford to overlook in devising new and lower cost methods. Why not give these men a chance to show you what can be done in your shop? Send blueprints of parts with complete details, including sequence of operations.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES

NEWS *of the* AUTOMOTIVE INDUSTRIES

Vol. 98, No. 3 February 1, 1948

January Automotive Output Under December

Production figures for January when available are expected to show that the output of cars and trucks fell considerably under the postwar high record set in December. General consensus among industry leaders now is that the industry will do very well to build as many cars and trucks in the first quarter of this year as it did in the last quarter of 1947. The steel picture is not improving, and pig iron is becoming increasingly tight. The general belief is that while 1948 will see an improvement of perhaps 10 per cent in production over 1947, this gain will have to be made in the last half of the year.

1948 PONTIAC

Hydra-Matic Drive is being offered as optional equipment on all 1948 Pontiac models. Striking exterior and interior refinements have been effected in the 1948 line, and the cooling capacity of the radiator core has been increased on six-cyl Pontiacs.

Pontiac Sets Hydra-Matic Price At $150

Price of the Hydra-Matic transmission as optional equipment on the 1948 Pontiac will be $150 list, according to Harry J. Klingler, Pontiac general manager. He said that otherwise prices for the new line will remain unchanged, at least for the present. He added, however, that costs of all materials and supplies have increased since the present prices were established early in 1947, and that he sees no indications of being able to reduce prices. Pontiac this year has introduced a deluxe line with finer interior appointments which sells for about $85 above the regular line. Currently 55 per cent of production is devoted to the eight-cyl line, which is capacity output for that model.

Halt Lincoln Production for 1949 Changeover

The first step toward introduction of the 1949 model Lincoln was taken late in January when production was completed on the 1948 model run. It is expected that the plant will be down for about a month for a changeover. It is reported that considerably more time will be involved in the Lincoln model changes than in either Ford or Mercury since more revamping of assembly lines and facilities will be required. Production of the Mercury will go down sometime this month in preparation for the changeover. Production of Fords, however, will continue until a later date.

Higher Prices Likely for 1949 Fords

It seems to be a foregone conclusion that prices on new Ford models when they are announced will be somewhat higher than current Ford prices. Henry Ford II, in a talk at Bronxville, N. Y., said flatly that the 1949 models will cost more to manufacture, and will be higher priced. He said, however, that they will be much better than previous models. He pointed out that the cost of doing business on Dec. 1, 1947, was $100 million a year greater than it was the same date a year previous, assuming that the same number of cars and trucks were produced annually.

Willys' First Fiscal Quarter Nets $1,283,445

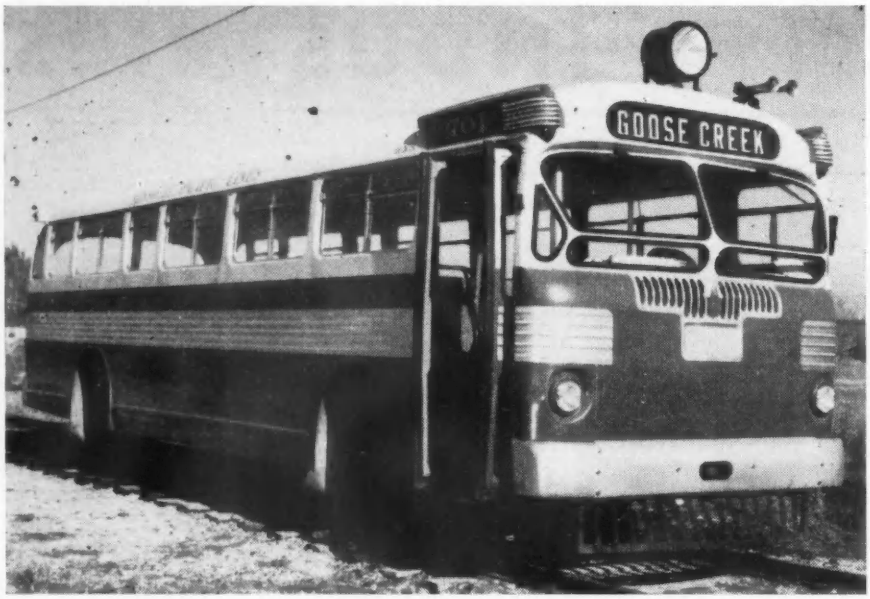
For the first quarter ending Dec. 31, 1947, of its fiscal year, Willys-Overland Motors, Inc., recorded its largest quarterly return for any peacetime year since 1928: a consolidated net profit of $1,283,445, after allowance for taxes. This net was based on net sales of $41,128,206, and compares with a net profit of $332,315 and net sales of $30,203,907 for the same period in the 1946-47 fiscal year. First quarter production totaled 32,884 vehicles.

Although Willys turned out its highest peacetime record since 1929, its output goal for 1948 is 99 per cent above last year. Willys built a total of 119,733 cars and trucks during 1947, and the 1948 goal is 238,000 vehicles. The company recently introduced its latest model, a six-cyl station sedan patterned after the station wagon, but with luxurious passenger car upholstery and finer interior appointments. A sports phaeton, a small open passenger car, is scheduled for production in May.

GM's 1947 Car & Truck Output Hits 1.9 Million

A final report on GM's 1947 automotive production shows 1,925,858 cars and trucks produced in the United States and Canada. Of the total, passenger cars accounted for 1,498,270 and trucks numbered 427,588. Highest monthly production record for the year

NEWS *of the* AUTOMOTIVE INDUSTRIES



RAILROADING BY BUS

Originally designated as model 41-S, but now known as 41-SRC, this urban type Twin Coach operates between Goose Creek and Highland, Tex., on the Houston North Shore RR, an electrified subsidiary of the Missouri Pacific Lines. The bus is equipped with special flanged wheels.

was set in December, with 194,477 cars and trucks in both countries, an increase of 20,443 over November.

New K-F Parts Paint Line to Operate Soon

Kaiser-Frazer Corp. is installing a new small parts paint line as part of its expansion program at Willow Run. The new line will relieve the present small parts paint set-up which is currently handling hoods, fenders, grilles, and similar larger sheet metal parts. These will be kept on the old line with many of the smaller parts being moved to the new paint line which includes 2500 ft of conveyor and is scheduled for completion in March.

The company expects to introduce a convertible model within the next few months, possibly by early summer. Production at Willow Run is now running close to 1100 units a day, with the highest point so far 1147 a day.

No Change in Buick Prices for 1948

In announcing the 1948 Buick line, Harlow H. Curtice, GM vice-president, disclosed that there would be no change from 1947 prices. The new Dynaflow Drive is offered as optional equipment on the Series 70 Roadmaster models. List prices at the factory without federal taxes follow: Special series—Model 41, four-door sedan, $1556; Model 46s, two-door sedanet, $1497; Super series—Model 51, four-door sedan, $1790; Model 56s, two-door sedanet, $1708; Model 56c, convertible coupe, $2175; Model 59, estate wagon, $2750; Roadmaster series—Model 71, four-door sedan, $2065; Model 76s, two-door sedanet, $1968; Model 76c, convertible coupe, $2463; and Model 79, estate wagon, $3030.

The new Dynaflow automatic transmission will cost Buick buyers exactly $206. Offered as optional equipment on the Series 70 Roadmaster, the Dynaflow is about $50 more than the Hydra-Matic transmission which is optional equipment on the Oldsmobile and Pontiac and standard equipment on the Cadillac.

Packard Dealers Get Car for Ton of Scrap

In an effort to boost the supply of scrap for its foundries, Packard Motor Car Co. has inaugurated a program under which the company's dealers obtain an additional car over their quota for every ton of scrap accepted and shipped to the company. However, the company reserves the right to inspect the scrap, and to refuse to accept it if it finds that it was obtained through purchase in the regular scrap market.

1948 Dodge Truck Prices Up 8 to 12%

Chrysler Corp. prices on the new Dodge truck line show an increase ranging from eight to 12 per cent. Not all of the increases are attributed to increased material costs, however, since the new models are greatly improved and offer more expensive features not found on the 1947 line.

GM is Selling Its Stock in Bendix

GM has announced that it is selling its 399,999 shares of Bendix Aviation Corp. common stock. GM has thus disposed of the remaining balance of the stock interest it held in Bendix Aviation continuously since 1929.

Cadillac 1947 Production Totaled 61,926

Producing a total of 61,926 passenger cars in 1947 to record the second greatest year in its history, GM's Cadillac Motor Car Div. reported that unfilled orders increased more than 50 per cent during the same period. Convertible output has been rescheduled at 12 per cent of 1948 production, and the demand for Hydra-Matic transmissions reached 98 per cent of all Cadillacs produced in 1947.

Hudson Buys Fruehauf Plant in Detroit

To be known as the Harper plant, six buildings including about 200,000 sq ft of factory space in Detroit have been bought by the Hudson Motor Car Co. from the Fruehauf Trailer Co.

Now installing hand sheet equipment, Hudson has incorporated the hand sheet mill, which it will operate in its newly-leased Shenango tin plate mill at New Castle, Pa., as the Valley Mfg. Co., a Hudson subsidiary. Hudson expects operations to start about April 1.

Ford $1.9 Million Contract to 3 California Firms

Three California firms will produce $1.9 million worth of parts for the 1949

Ford, the Ford Motor Co. recently disclosed. The Cannon Electric Development Co., Los Angeles, will produce a million dollars worth of ornamental die castings, and is setting up facilities to make horns for Ford, which will mean an additional $400,000 yearly for the Los Angeles firm. A $400,000 contract has been awarded to Bendix Aviation Corp., Pacific Div. for the manufacture of master brake cylinders. The R. H. Osbrink Mfg. Co. also of Los Angeles has received a $100,000 contract for the production of permanent-mold aluminum castings for camshaft timing gears.

CONVERTIBLE PLAYBOY

The 1948 Playboy convertible features on all-steel top which can be rolled back, and an all-steel, all-welded body. The Playboy's overall length is 155 in.; overall width is 59 in.; and the wheelbase measures 90 in.

National British Racer Likely in 1948

With the promise of British Government support, there is a strong probability of a national British racing team coming into existence during 1948. The set-up of the British Motor Racing Research Trust, established in 1947, is rather complicated. It comprises a main committee, a production committee, a financial and planning committee, and a publicity committee. Some 35 automotive concerns are co-operating, in addition to Rolls Royce on engine technique. No announcement has been made as to the form government assistance will take. It is understood that a V-16, 91.5, cu in. racing model will be built.

A similar national racing scheme is in full operation in France, and is financed by a small turnover tax on all automotive concerns. The French organization, known as the Centre d' Etudes Techniques possesses central offices, a very complete automobile laboratory, a new heat treatment laboratory, and has the use of both the State aeronautical laboratory and the State-owned race and test track at Montlhery.

New GM Stamping Plant in Hamilton, O.

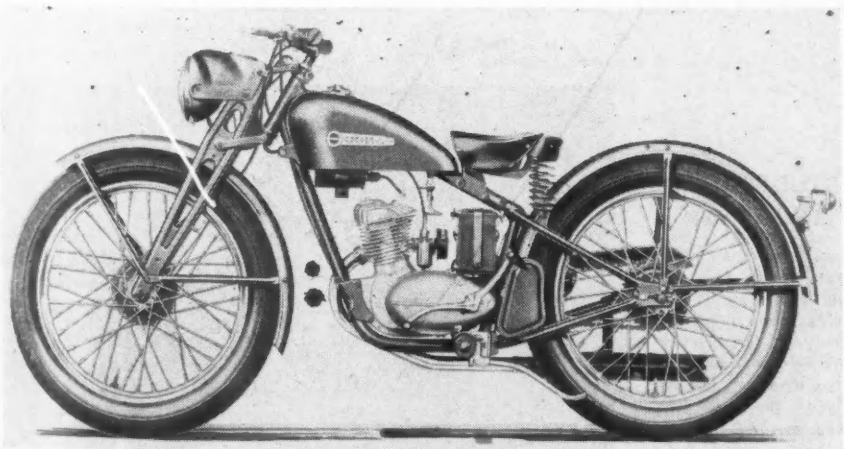
Scheduled to begin production in the spring, a new GM Fisher Body stamping plant is now being completed in Hamilton, O. Reportedly one of the largest stamping plants under one roof, it is being constructed around a new line of Lima-Hamilton presses.

Playboy Formally Opens Plant on Jan. 20

On Jan. 20, the Playboy Motor Car Corp. formally opened the recently awarded WAA plant in Tonawanda, N. Y., which was operated by GM's Chevrolet Motor Div. during the war. Having completed 15 pilot models, Playboy expects to get into volume output in September.

Ferguson to Import Tractors for U. S. Sale

Harry Ferguson Co. has placed an order for $20 million worth of new Ferguson System tractors with its British affiliate, Harry Ferguson, Ltd., Coventry, England. Shipments are expected to reach 100 a day shortly. The company announced that the tractor is equipped with engines built by Continental Motors. A company statement also said that arrangements for a tractor plant in this country will be completed soon.



1948 HARLEY-DAVIDSON

The new 1948 Harley-Davidson "125" motorcycle is the first two-cycle motorcycle in the company's history. The new motorcycle weighs about 170 lb. and employs a foot-operated three-speed gear shift and a handlebar-controlled clutch. It has a piston displacement of 125 cu cm. Exhaust gases are dispersed by loop scavenging

New 1948 Ford Truck Prices Up 5.6 Per Cent

Showing an average increase of 5.6 per cent, list prices of new 1948 model Ford trucks range from $890 for the series F-1, six-cyl, one-half ton chassis and cowl to $2135 for the F-6 series, cab-over-engine, two-ton, eight-cyl stake truck. List prices of the new F-7 and F-8 trucks range from $2485 for the F-7, 135-in. wheelbase chassis and cowl to $3430 for the series F-8, three ton, 195-in. wheelbase chassis and cab.

NEWS *of the* AUTOMOTIVE INDUSTRIES

NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the Eleven Months' 1947 Totals.

MAKE	November 1947	October 1947	November 1946	ELEVEN MONTHS Units 1947	Units 1946	Per Cent of Total 1947	Per Cent of Total 1946
Chevrolet	50,592	52,596	46,814	576,434	256,235	20.20	16.63
Ford	48,477	50,233	38,323	480,575	287,614	16.83	18.67
Plymouth	21,609	26,354	19,534	282,441	192,133	9.89	12.47
Buick	20,957	24,509	20,481	222,520	102,822	7.79	6.67
Dodge	15,976	19,495	12,992	189,116	121,136	6.62	7.86
Pontiac	16,939	17,342	18,682	185,755	93,302	6.51	6.06
Oldsmobile	14,103	15,114	15,316	163,513	74,884	5.73	4.86
Mercury	11,512	11,830	8,997	97,878	52,335	3.43	3.40
Nash	7,612	8,175	9,583	93,913	74,082	3.29	4.81
Studebaker	8,883	9,993	6,906	92,104	49,594	3.23	3.22
Chrysler	7,525	8,333	6,191	84,578	58,833	2.96	3.82
Hudson	1,491	4,601	7,962	80,850	64,047	2.83	4.16
De Soto	5,977	6,640	4,693	65,585	49,138	2.30	3.19
Kaiser	7,047	6,643	876	47,220	1,014	1.65	.07
Cadillac	4,445	2,913	3,965	47,104	19,026	1.65	1.23
Frazer	5,831	6,181	613	44,035	737	1.54	.05
Packard	4,673	4,503	5,240	42,966	30,966	1.50	2.01
Lincoln	2,122	2,198	1,662	21,721	9,023	.76	.59
Willys	1,804	2,256	762	21,486	1,003	.75	.06
Crosley	1,321	1,476	724	14,455	1,988	.51	.13
All Others	38	43	108	719	549	.03	.04
Total	258,934	281,428	230,424	2,854,968	1,540,461	100.00	100.00

* Data from R. L. Polk & Co.

No Increase in Price of '48 Chevrolet

The 1948 model Chevrolet, just introduced with minor changes, will carry no increase in price, according to T. H. Keating, Chevrolet general sales manager.

Automobile Makers Renew Patent Agreement

New agreements under the automobile industry's patent cross licensing plan have been completed, and the plan is now in its 34th year of operation, according to AMA. The new agreements make the 12th time that the plan has been extended. Included under the last agreement which with certain exceptions covers patents owned on Jan. 1, 1940, are 17 motor vehicle companies, which account for 95 per cent of the vehicle production by AMA members.

Goodyear Retread Combats Slippery Driving

At least a partial answer to the winter driving problem has been announced by Goodyear Tire & Rubber Co. It says that it has developed a new tire tread known as Skid-Rid, which is used for retreading automobile tires. It is described as a rough abrasive substance, which is milled into the camelback, and which is exposed to the road surface after about 100 miles of wear. The company says that two years of road tests have shown highly satisfactory results in reducing skidding and sliding of automobiles on snow, ice, and wet pavement.

IHC Now Principal Stockholder of Metropolitan Body

The International Harvester Co. has purchased the principal stock ownership of the Metropolitan Body Co. in Bridgeport, Conn. Metropolitan, which has supplied International with special bodies for its lighter truck models for a number of years, will continue to operate the business as a wholly-owned subsidiary of International.

Plymouth Now Equipped With Low Pressure Tire

Chrysler Corp.'s Plymouth Div. is the last of the Chrysler divisions to complete the changeover to low pressure tires as standard equipment. It is believed that all companies will eventually adopt the new type tire, although some will probably be delayed until the 1949 models. Buick is adopting it on part of its line, but Pontiac did not make the changeover on its 1948 models. On the Oldsmobile, the tire will be standard on deluxe models and available as optional equipment at extra cost on other models.

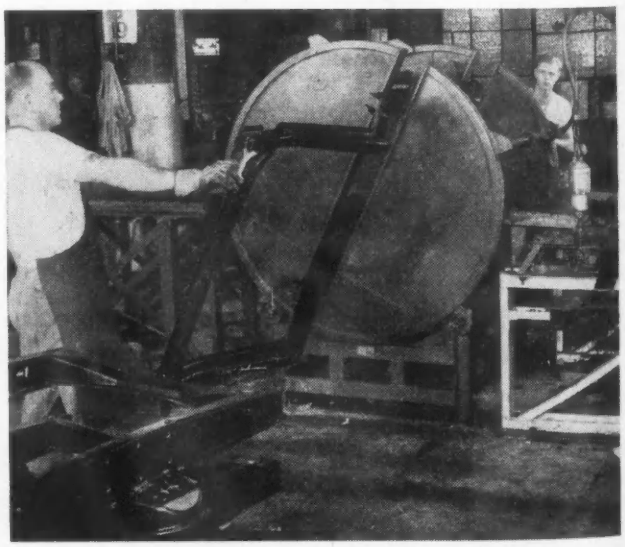
See New Tire Output Record in 1947

That 1947 will be a record-breaking year for automotive tire production and shipments is clearly indicated by actual figures for the eleven months which were recently announced by the Rubber Manufacturers Association. These show that by Nov. 30, 1947, 71,168,058 passenger casings and 16,330,552, truck and bus casings had been produced as compared with 60,371,664 and 14,415,357 respectively for the same period in 1946.

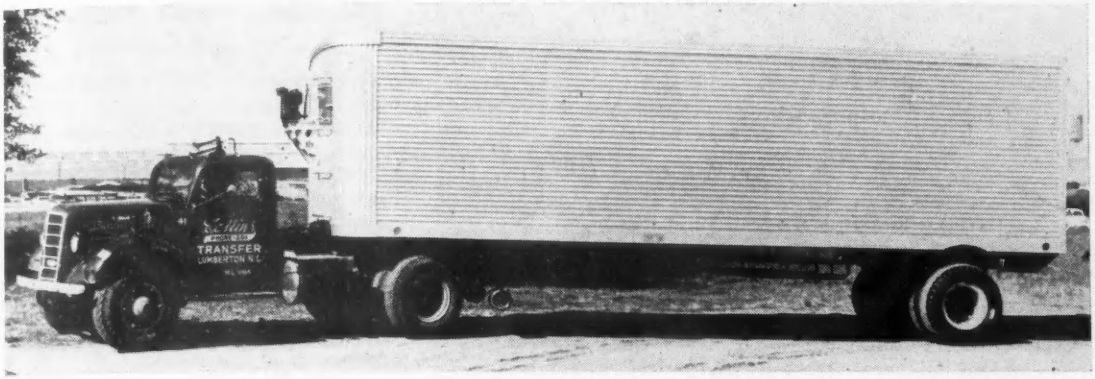
The sharp increase in truck, bus and passenger car mileage is reflected in the announcement that in 1947 the rubber industry produced an estimated

STUDEBAKER TURNOVER

Consisting of a slotted drum which turns on four ball bearings supported on a welded base, this turnover fixture, developed by Studebaker, has replaced the hoist and sling method of turning an automobile frame in the limited space of the assembly line.



NEWS *of the* AUTOMOTIVE INDUSTRIES



WOOL COOL

Especially designed for the transportation of perishables, Great Dane Trailers, built by the Steel Products Co., Savannah, Ga., are insulated with mineral wool. A 1.5 in. felt thickness of low thermal conductivity mineral wool is installed inside the steel sheet of the trailer, which is equipped with ice bunkers and a blower system.

$3 billion of finished products and used up 1,110,000 long tons of new rubber, according to the Rubber Manufacturers Association, Inc. Compared with the previous peak year of 1946, estimated 1947 production and consumption follows:

PRODUCTION

	1947	1946
	(in units)	
Passenger Car Tires	77,000,000	66,466,000
Truck and Bus Tires	17,500,000	15,832,000
Truck, Bus and Passenger Tubes	80,000,000	77,251,000

CONSUMPTION

	1947	1946
	(in long tons)	
Natural Rubber	556,000	277,597
Synthetic Rubber	554,000	761,699
Total New Rubber	1,110,000	1,039,296
Reclaimed Rubber	285,000	275,410

Moore Builds New Car for Indianapolis Race

Lou Moore, whose racing cars won first and second places in the Indianapolis races last year, will enter a new third car in the race this year. It is reported that the new racer has a shorter wheelbase than Moore's current Blue Crown specials, and has a rear wheel drive. The two winning cars last year had front wheel drive. Mauri Rose and Bill Holland, the two winning drivers in last year's race, will drive for Moore again this year, it is reported.

Nuffield Cuts Export Prices of Cars & Trucks

Faced by stiffening American competition, restricted markets and the reluctance of foreign buyers to pay high prices, Britain's largest manufacturer of motor vehicles, the Nuffield Organization, has substantially reduced the export prices of the majority of Morris, Wolseley and Riley automobiles and of Morris commercial vehicles, according to an International News dispatch from London. This action follows Sir Stafford Cripp's call for more competitive price levels, and is the harbinger of similar steps by other manufacturers in the same and other industries.

U. S. Truckers Resume Shipment Through Canada

Under an agreement with the Canadian government, truck shipments from the United States through Canada in bond to points in the eastern U. S. are being resumed. The arrangement had been in effect during wartime, and had been terminated at the end of 1945. The new agreement came about as a result of the Geneva Trade Agreement, and will reduce the distance trucks must travel to eastern points by about 110 miles.

Forecast Record '48 Output of Machine Tools

A record peacetime production of machine tools in 1948 was predicted in Chicago by A. G. Bryant, president, and Tell Berna, general manager of the National Machine Tool Builders Association. Mr. Bryant is also president of the Bryant Machinery & Engineering Co. and vice-president of the Cleereman Machine Tool Co.

Ford Names Graeme K. Howard Export Consultant

Graeme K. Howard, former GM vice-president in charge of overseas operations, has been appointed as a consultant to survey the Ford Motor Co.'s International Div. and its foreign subsidiaries.

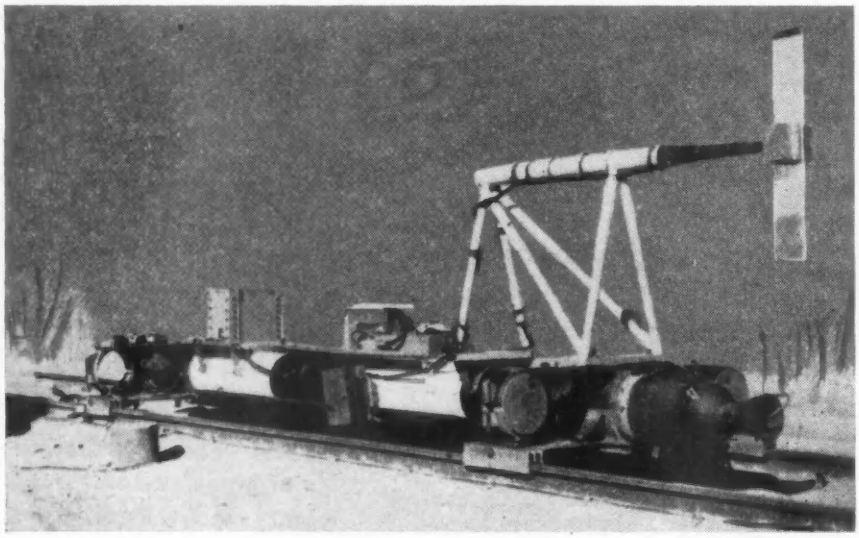
NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the Eleven Months' 1947 Totals.

MAKE	November 1947	October 1947	November 1946	ELEVEN MONTHS Units 1947	Units 1946	Per Cent of Total 1947	Per Cent of Total 1946
Chevrolet	24,518	25,970	19,469	207,870	148,806	25.62	26.77
Ford	10,945	17,142	14,375	181,527	117,175	22.37	21.08
Dodge	10,221	11,801	8,258	118,481	87,547	14.60	15.75
International	9,028	11,390	7,051	104,650	71,437	12.90	12.85
Willys	4,836	4,822	3,815	45,324	38,730	5.59	6.97
G.M.C.	4,525	4,672	3,507	44,640	21,299	5.50	3.83
Studebaker	3,458	3,889	2,406	38,393	22,376	4.73	4.03
White	1,074	1,275	1,186	12,084	8,966	1.49	1.61
Reo	1,026	1,080	1,125	11,952	9,228	1.47	1.66
Mack	981	1,215	61	10,109	4,443	1.25	.80
Diamond T	915	1,080	509	9,769	4,439	1.20	.80
Federal	552	598	420	5,537	4,082	.68	.73
Divco	404	612	370	4,522	3,422	.56	.62
Autocar	285	378	438	4,036	4,083	.50	.73
Brockway	319	412	344	3,930	3,358	.48	.60
Hudson	24	97	193	2,514	2,313	.31	.42
F.W.D.	118	102	79	1,116	534	.14	.10
Sterling	47	64	41	545	477	.07	.09
Ward La France	33	42	.....	474	.....	.06	.....
Oshkosh	23	11	.....	222	.....	.03	.....
Miscellaneous	405	515	331	3,747	3,081	.45	.56
Total	73,737	87,167	63,978	811,442	555,796	100.00	100.00

* Data from R. L. Polk & Co.

NEWS *of the* AUTOMOTIVE INDUSTRIES



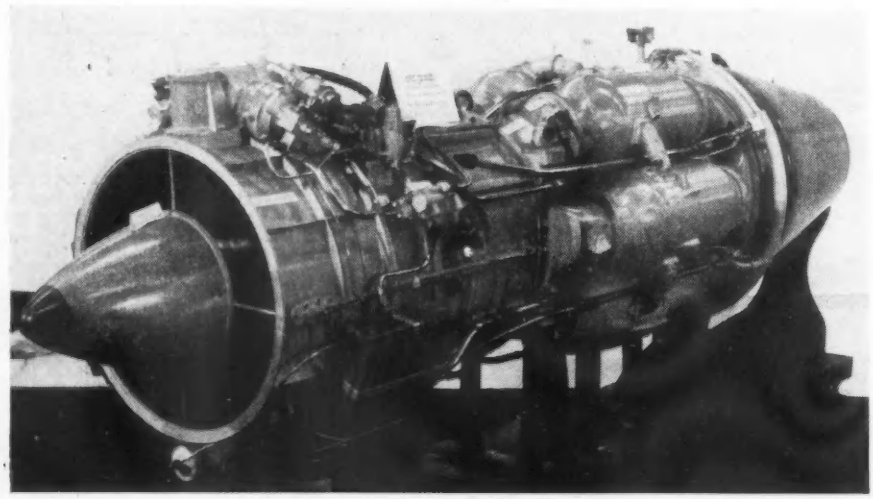
Press Association, Inc.

RAILROAD ROCKETING

Hurtling at over 1000 mph over these tracks at Muroc, Calif., this rocket-powered sled is being used by Northrop Aircraft to determine the practicality of an "outdoor wind tunnel" for testing experimental aircraft models at supersonic speeds.

New Canadian Jet Transport Being Developed

A 400-mph jet-powered transport aircraft which will carry 30 to 40 passengers at an altitude of 30,000 ft, is now under development by A. V. Roe Canada Ltd. Designated the C.102, the new plane will be powered by four Rolls-Royce Derwent Mark V jet engines, paired in two nacelles. Each of the Derwents will develop 3500 lb static thrust. The cabin will be pressurized and air-conditioned, and the manufacturer reports that the plane will incorporate the latest design and safety devices for crew and passengers. The prototype is expected to be ready for test flight about the end of this year.



FIRST CANADIAN JET

The first jet engine to be designed and manufactured in Canada, this new aircraft power plant, the Chinook, is a product of A. V. Roe Canada Ltd. Major components are a nine-stage axial-flow compressor, six through-flow combustion chambers, a single-stage axial-flow turbine, and an exhaust tail cone. It has a maximum OD of 32 in., overall length from nose bullet to tail cone flange of 125.137 in., and total weight including auxiliaries of 1250 lb. It develops 2590 lb thrust at 10,100 rpm for take-off.

Studebaker 1947 Production Best in Its History

Studebaker in 1947 had its best production year. The company built 191,451 passenger cars and trucks to surpass a 24-year-old mark of 150,192 set in 1923. Production in 1947 was 42.9 per cent above the 1941 level.

Four New Silvaire Planes by Luscombe

With the announcement of four new models, the 85-hp Silvaire Standard-85, and Silvaire Special-85, together with the 90-hp Silvaire Master-90, and Silvaire De Luxe-90, the Luscombe Airplane Corp. of Dallas, Tex., has disclosed that all nine Silvaire models now employ the Silflex Landing Gear. Developed by Luscombe, the Silflex Landing Gear is a tapered, tubular steel cantilever system with hydraulic shock absorbers. The two new 85-hp Silvaires have a cruising speed of 112 mph, a rate of climb of 800 fpm, and a service ceiling of 16,000 ft. The two new 90-hp Silvaires have a 115 mph cruising speed, an 850 fpm rate of climb, and a 17,000 ft service ceiling.

Name Greenewalt as President of du Pont

Crawford H. Greenewalt was recently named president of E. I. duPont de Nemours & Co., while Walter S. Carpenter, Jr., was elected chairman of the Board, following the retirement of Lammot du Pont from the latter post.

New U. S. Rubber Synthetic for Tire Treads

Two large plants at Barger, Tex., and Baton Rouge, La., are now being equipped by U. S. Rubber Co. to produce a new synthetic rubber for tire treads. It is said that the new rubber is made at between 0 F and 40 F, instead of at the customary 125 F.

Automobile Credit Sales Continue Up

Outstanding installment credit on automobile sales continued its upward climb during November, according to the Federal Reserve Board. At the end of that month, automobile credit stood at $1,009,000, an increase of $52 million or about five per cent above the Oct. 31 figure. From Nov. 30, 1946 to Nov. 30, 1947, installment sale credit for automobiles increased $594 million.

NEWS *of the* AUTOMOTIVE INDUSTRIES

Open GM's B-O-P Plant in Del. on Feb. 3

In operation and increasing output steadily, GM's new Buick-Oldsmobile-Pontiac assembly plant in Wilmington, Del., will be opened formally on Feb. 3.

Raise New Car Tire Prices 5 Per Cent

It has been confirmed that major tire producers have increased prices on original equipment tires a weighted average of about five per cent. The tire manufacturers say that higher production costs have made the increase necessary.

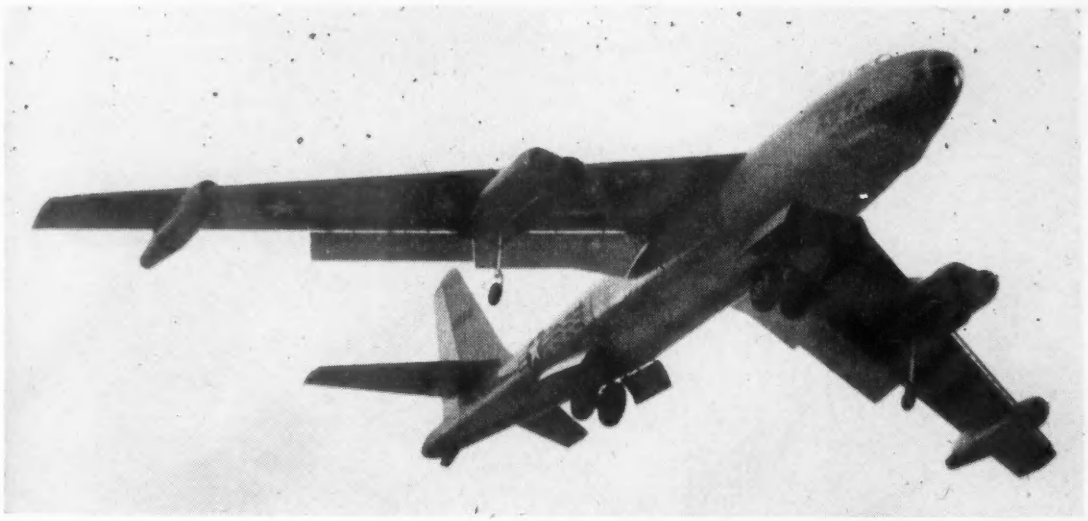
totals for last year by months shows that in the first eight months of 1947, before the Taft-Hartley Act was passed, there were 2955 strikes with a loss of 29,900,000 man-days. During the four months following the passage of the act, the number of strikes dropped to 645 and man-days idle to 5,100,000. The figures are from the Department of Labor.

Ford Employe Turnover Rate Down 37% in 1947

Ford Motor Co. appears to be making progress in stabilizing its labor force. According to recent figures, the average monthly turn-over rate of hourly paid personnel at the Rouge plant declined 37 per cent last year under 1946. The company also points out that the 2.2 per cent turnover rate last year was less than half that of the industry average. The rate for the industry as a whole last year was 4.5 per cent.

Settle Hudson Foremen Strike by Compromise

About 550 foremen at the Hudson Motor Car Co. returned to work on Jan. 22 after a nine day strike to force recognition of the Foremen's Association of America as bargaining agent. In that respect they failed, but they did win an agreement from Hudson that the company and representatives of supervision will develop a written workable understanding for their mutual benefit within 30 days. Thus, in effect, the Hudson local has agreed to scuttle the FAA and deal directly on a local level.



FIRST FLIGHT

Flown for the first time recently, the Boeing XB-47 Stratojet's top speed was in the 500 mph class according to the Air Force. With reportedly the greatest power potential of any airplane in the world, the XB-47 has six GE J-35 turbojet engines with a total of 24,000 lb of thrust, plus 18 Aerojet JATO rocket motors with a total of 18,000 lb thrust.

Labor

Demand for 25¢ Hourly Boost Opens Third Round

The shape of the upcoming third-round wage drive has become apparent following a meeting of the UAW-CIO executive board in January. The new demands include a flat 25 cents an hour wage increase; a health insurance program at a cost of an additional five cents an hour to the company; a guaranteed 40-hour work week; and three weeks' paid vacation for workers with five years or more seniority, instead of the two weeks now in the contract.

Sharp Drop in Strikes Since Taft-Hartley Act

Frank Rising, general manager of Automotive & Aviations Parts Manufacturers, Inc., points out that strike

Independent Union Raids CIO At Cadillac

For the first time since the passage of the Taft-Hartley Act, under which workers are privileged to join unions of their own choosing, a rival union has attempted to raid members from the UAW-CIO. The National Association of Machinists, an independent union, is continuing an organizational drive at the Detroit plant of GM's Cadillac Motor Car Div. The union claims that it has recruited a substantial number of the 600 skilled workers at the plant, and will petition the NLRB for an election in late February.

Metals

Copper

Brass and wire mills have been unable to completely fill their February copper needs, although producers report that most February domestic copper has been sold. Some February foreign copper, however, is still available. For foreign and domestic sales, the 21.50¢ price is being adhered to by major producers.

Lead

Lead consumers are indicating inability to fill more than a part of their current needs. However, in view of the battery industry's usual decline in consumption in March, there may be an increase in available lead in the near future.

(*Turn to page 90, please*)

Nothing Rolls Like a Ball . . .

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The Automobile Industry That's Behind the Iron Curtain

A Revealing and Authoritative Story on How the Soviets Have Tried to Attain Mass Production of Motor Vehicles under a Planned Economy

By D. B. Shimkin, Ph.D.

Characteristics Typifying the USSR Motor Vehicle Industry

Extreme Emphasis on Truck Production
Limited Variety of Models Produced
Overwhelming Dependence Especially on American Prototypes
Inefficiency of Production
High Overhead
Low Productivity per Worker
Great Waste and Low Quality
Short Vehicle Life and High Operating Costs
Inferior Gasoline and Lubricants
Wide Gaps Between Plans and Performance

THIS special article on the USSR motor vehicle industry by Dr. Shimkin, until recently of The Institute for Advanced Study at Princeton, N. J., and now a member of the staffs of the Department of Social Relations and the Russian Research Center at Harvard University, is being presented in Automotive Industries in three parts beginning with this issue. It is the plan of the Editors to publish the other two parts in succeeding issues. Following his analysis in Part I of the technological characteristics of the Soviet automobile industry and vehicles, the author will discuss the production and design trends in Part II, and Part III will be devoted to research and development in that country.

The article is a comprehensive report which Dr. Shimkin prepared after specializing during the past six years in economics with particular reference to comparative technology of the United States and the USSR. Much of it was derived from a thorough search of Soviet technical literature of the past decade, plus a knowledge of Russian technical problems obtained from wartime staff experiences in Europe and in connection with the Lend Lease program. For technical criticism of the article Dr. Shimkin is indebted to Dean K. H. Condit of the School of Engineering, Princeton University.

FROM the standpoint of automobile design, examination of the motor-vehicle industry of the USSR shows that, since its beginning, it has been overwhelmingly dependent upon foreign and especially American prototypes. However, in a few specialized fields—pre-heating devices and electrical systems for winter operation, gas-producer vehicles, and alloy development—significant independent progress has been made. And, while Soviet automobile development will unquestionably accelerate in coming years, the overall difference in technological stature between the motor-vehicle industries of the Soviet Union and the United States is so great that the latter can expect few major contributions from the former in the predictable future.

Consequently, the primary significance of the present study derives from the light it can throw on the general technological position of the USSR in relation to that of the United States, and on the impact of a controlled economy on technological progress. Evaluation of this impact must be tempered by understanding of the great poverty and backward economic position of the USSR at the beginning of its economic expansion in 1927, of the large proportion of Soviet national income diverted to direct military expenditures since 1937, and of the effects of World War II

TABLE I—FOREIGN PROTOTYPES OF SOVIET VEHICLES AND COMPONENTS

MAKE AND MODEL	USSR Vehicles or Components		PROTOTYPE	
	Component	Date	Make and Model	Date
KIM-10	Entire vehicle	1939	British Ford 10 hp	1935
GAZ-A	Entire vehicle	1932	Ford A	1928
GAZ-M1	Entire vehicle	1936	Ford B	1933
GAZ-M11	Engine	1940	Continental F6209[a]	1935
GAZ-M20	Engine	1947[b]	Continental F4140[a]	1938
GAZ-M20	Gearset	1947[b]	Ford B	1933
GAZ-AA	Entire vehicle	1932	Ford AA	1930
GAZ-MM	Entire vehicle	1935	Ford 1½ ton truck	1933
GAZ-61	Chassis	1941	Marmon-Herrington LD 1-4[c]	1937
ZIS-101	Entire vehicle	1936	Buick 33-90	1933
ZIS-101A	Engine	1940	Buick 36-90	1936
ZIS-110	Entire vehicle	1945	Packard Custom Super 8-1808	1940
AMO-F15	Entire vehicle	1924	Fiat 1½ ton truck	1923[d]
AMO-2 & 3	Entire vehicle	1930	Autocar SA-2	1929
ZIS-5	Engine	1933	Hercules WXC	1928
ZIS-5	Gearset	1933	Brown-Lipe 314	1930
ZIS-150	Engine (ZIS-120)	1947[b]	Hercules WXC (1941)	1941
ZIS-253	Engine	1947[b]	GM Diesel 3-71	1938
YaZ	Engine	1926	Fiat 1½ ton truck	1923[d]
Ya-5	Engine	1929	Hercules YXC[e]	1927
Ya-5	Gearset	1929	Brown-Lipe 60	1923
YaG-3	Engine (AMO-2)	1931 ?	Autocar SA-2	1929
YaG-6	Engine (ZIS-5)	1933 ?	Hercules WXC	1928
YaG-6	Gearset	1933 ?	Brown-Lipe 314	1930
YaG-10	Engine	1936	Hercules YXC[e]	1927
YaG-10	Gearset	1936	Brown-Lipe 554	1931
YaAZ-200	Engine (YaAZ-204)	1947[b]	GM Diesel 4-71	1938

NOTES:
[a] Modification, not complete copy.
[b] Plan.
[c] Modified Ford V-8.
[d] First reference in Automotive Industries in 1923, but may be somewhat older.
[e] Imported.

TABLE II—SPECIFICATIONS OF SOVIET GASOLINES.

GASOLINE	Percentage Evaporated at Temperature (F)			Distillation Residue %	Gum (mg per 100 ml)	Octane Rating
	10%	50%	90%			
I. Soviet Official Specifications and Tests:						
1. Krzhivitskii Report, 1942-43:						
a. Indicated Standard (GOST)	(185)	(276)	(420)	1.5	5	64-65
b. Actual test results—						
Sample 1	(218)	(286)	(429)	2.5	.....	58.5
Sample 2	(231)	(311)	(440)	2.5	.....	56
Sample 5	(188)	(282)	(421)	2	.....	57.1
2. Specifications (1943-46):						
a. Wartime standard (GOST V2084-43)	(200)	347	446	.....	10	56-60
b. Postwar Standard (GOST 2084-46)	185	302	410	1.5	10	60 or 70[a]
c. Postwar winter (GOST 3254-46)	163	284	374	1.5	10	60 or 70[a]
d. ZIS-110 Special (GOST 3297-46)	158	221	329	.....	.....	74
3. Aviation Gasoline:			Under			
a. KB-70	.....	.....	302	1.2	2	70
b. B-70	.....	.....	302	1.5	2	70
II. A.S.T.M. Minimum Standards (1946):						
1. Type A (Normal)	140 (W) 158 (S)	284	392	2	7	70 or 77[b]
2. Type B (High volatility)	140 (W) 158 (S)	257	356	2	7	70 or 77[b]
3. Type C (Low volatility)	167	284	392	2	7	50
III. Krzhivitskii Minimum Recommendations:						
1. Winter	122-140	230-241	351	.....	.....	70
2. Summer	172-176	298	385	.....	.....	70

NOTES:

Interpolated figures are in parentheses.

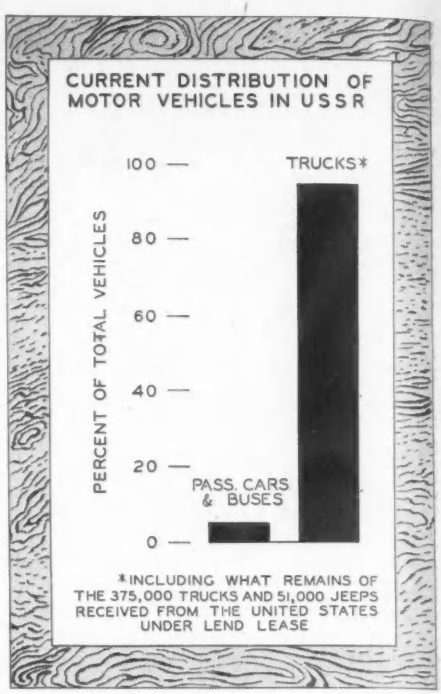
[a] "60" (60 octane), unleaded, for ZIS-5, GAZ-AA; "70" (70 octane) with not over 1.5 mg/kg of ethyl fluid, for GAZ-51, ZIS-150, etc.

[b] 70 octane for standard gasoline; 77 octane for premium gasoline.

(W) Winter.

(S) Summer.

..... Data not available.

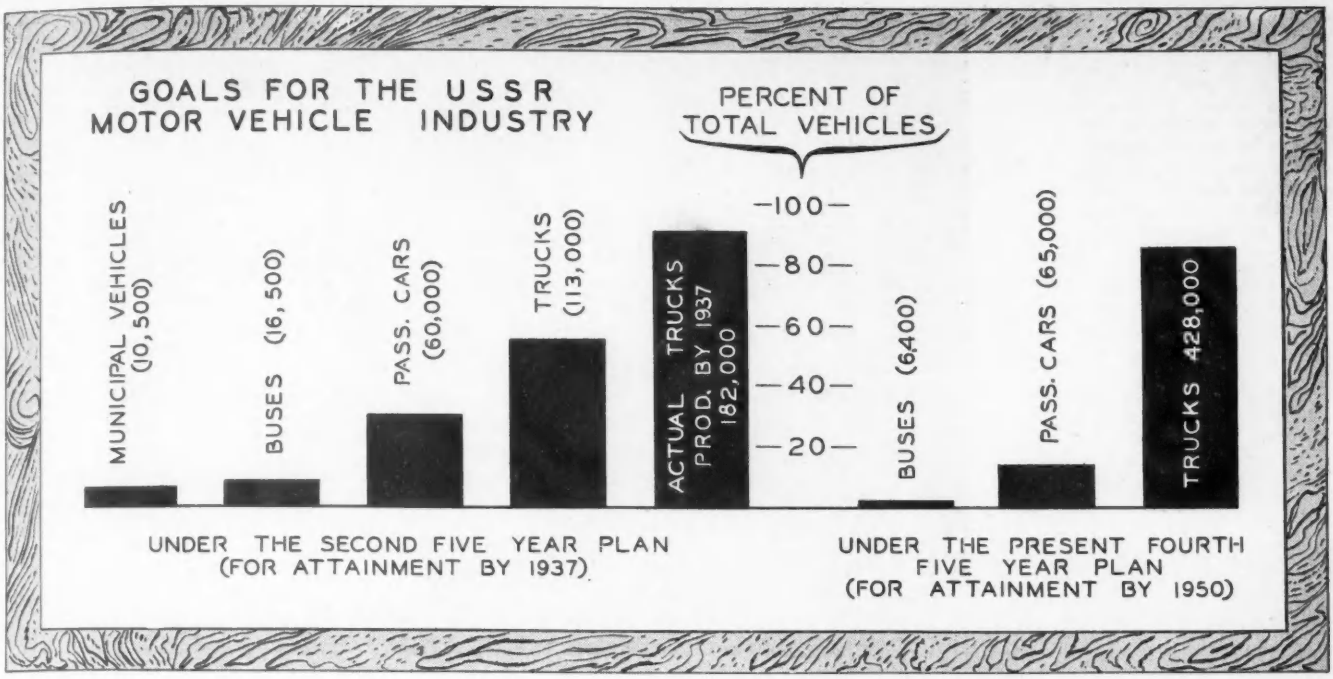


on the USSR. In 1927, the national income and average level of production in the USSR were less than those of the United States in 1890. By 1940, when national income in the USSR had reached a level corresponding to that of the United States in 1905, direct military expenditures were swallowing over 25 per cent of that national income, and seriously inhibiting economic and technological growth. World War II introduced an enormous problem of economic rehabilitation, but it also provided an electrifying stimulus to Soviet technology—a new yardstick of design and productive technique—when Lend Lease gave the USSR its first large-scale access to advanced American and British research, development and production.

Seven characteristics typify the motor-vehicle industry of the USSR most sharply: extreme emphasis upon truck production, limited variety of models produced (coupled nevertheless with inadequate standardization), overwhelming dependence upon foreign — especially American — prototypes, inefficiency of production with high overhead, low productivity per worker, great waste and low quality; short vehicle life and high operating costs; and very inferior gasoline and lubricants and appreciable gaps between announced plans and actual performance.

Emphasis on Trucks

While Soviet planners have placed great stress upon truck production, the percentage of production devoted to trucks has been consistently even higher than planned. The Second Five-Year Plan, which was the earliest to set up detailed goals for the automobile industry, proposed manufacturing 113,000 trucks, 60,000 cars, 16,500 buses and 10,500 municipal service cars by 1937. Thus the planned percentage of trucks was 56.5 per cent of the total motor-vehicle planned production. In fact, however, truck production in 1937 amounted to 182,000 or 91 per cent of the total motor-vehicle



planned output. The Third Five-Year Plan increased the proposed percentage of truck production to 75 per cent, but the coming of the war raised this percentage almost to 100. The present Fourth Five-Year Plan contemplates production of 428,000 trucks, 65,000 passenger cars and 6400 buses by 1950, with 85.6 per cent of production consequently being devoted to trucks. Currently, even this percentage is being exceeded, since output of two of the three types of passenger cars (GAZ M-20 and Moskvich) has been held up by raw materials and tooling bottlenecks.

Limited Variety—Inadequate Standardization

Consequently, if the 375,000 trucks and 51,000 jeeps brought in by Lend Lease be included, fully 95 per cent of the motor-vehicles in the USSR today are trucks. Of the Soviet-manufactured trucks, nearly two-thirds are 1½ to 2-ton GAZ trucks produced at Gorkii, one-third are 2½ to 3½-ton ZIS trucks produced at Moscow, and less than two per cent are five to eight-ton trucks produced at Yaroslavl.

TABLE III—SPECIFICATIONS OF SOVIET ENGINE OILS

Physico-Chemical Index	Oil (Avtol)			
	18	10	8	6
1. Max. specific gravity	0.926	0.926	0.911	0.910
2. Max. Engler viscosity at 100 C	2.3	1.8	1.6	1.45
3. Max. Engler viscosity at 50 C	....	11	5.5–6.5	3.5–4.0
4. Max. relative viscosity: 50 C to 100 C	7.75	5.5	4.0	....
5. Min. flash temperature (Brenken) (C)	215	200	185	180
6. Acid index, mg KOH per gm. oil (max.)	0.42	0.28	0.14	0.15
7. Max. % tar (Conradson)	0.6	0.4	0.3	0.15
8. Max. % ash	....	0.25	....	....
9. Max. freezing temperature (C)	0	−5°	−17°	−30°

The Soviet motor-vehicle industry has always stressed mass production of a very limited number of vehicle and component models. Even as a long-range objective a limit of some 50 models: four to five-passenger car types, seven commercial trucks, seven all-wheel drive trucks, three armored cars, three city buses, three interurban buses, and two trolley buses, plus tractor-trucks, artillery prime movers, etc., are believed to be adequate. And these models would be achieved through various combinations of 10 engines (stemming from three or four families of related four, six and eight-cylinder gasoline and three, four and six-cylinder Diesel types), 11 gearsets, six clutches and 11 tire sizes.

In fact, the variety of vehicular types actually manufactured has been even more limited: light, medium, and heavy passenger cars; standard, six-wheeler, front-wheel-drive and dump gasoline trucks; gas-producer trucks, buses, half-tracks and fire-engines, with Diesel trucks planned but not yet in production.

The range of engine-types, from the standpoint of power, has also been inadequate, with no truck engine generating over 90 hp yet having been produced. As a result, trucks rated at five metric tons (YaG-6) have had to be powered by 73 hp engines; and eight-ton trucks (YaG-10), by imported 90 hp engines originally intended for lighter vehicles (Ya-5). In all of Soviet motor vehicle history not more than a dozen types of gearsets have been manufactured. Because of this, light trucks (GAZ-AA, MM and 51) gas-producer trucks (GAZ 42) and military 4x4 vehicles (GAZ 61 and 63) have had to adopt the same, unspecialized gearset.

Nevertheless, the Soviet Union has not reaped the full benefits of mass-production and rigid standardization. Despite the limited variety of types, the number of models of vehicles and

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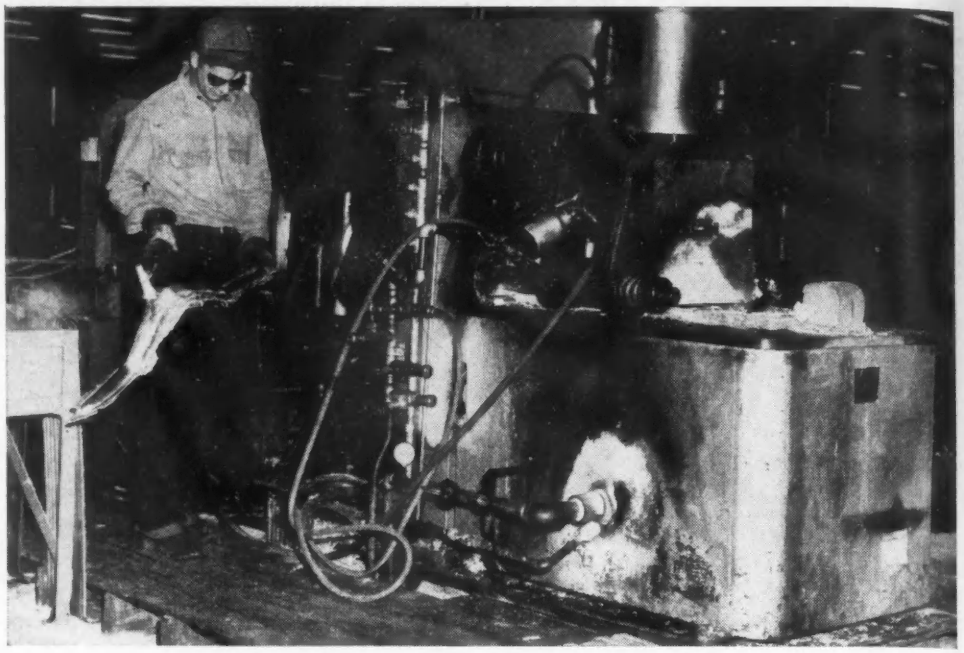
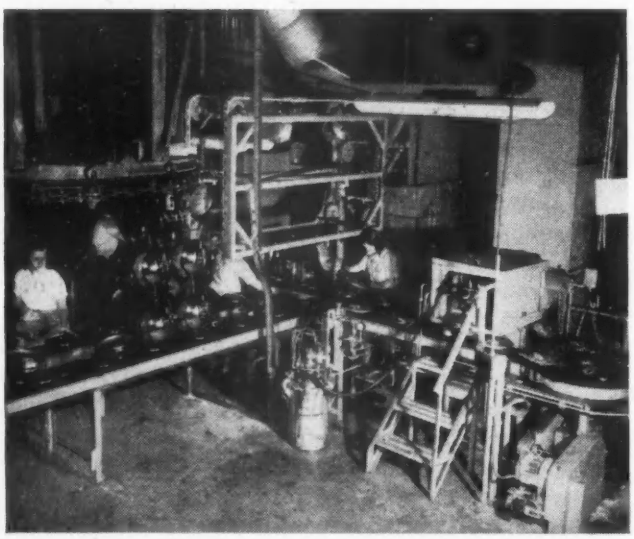


One of a battery of new die-casting machines for producing the variety of high purity zinc die castings. The operator is shown holding a long radiator grille bar.

New GM Supplier Plant

Decentralized Unit in Ohio Extends Scope of Parent Syracuse Plant in Manufacturing Hub Caps, Bumper Guards and Grilles

By Joseph Geschelin

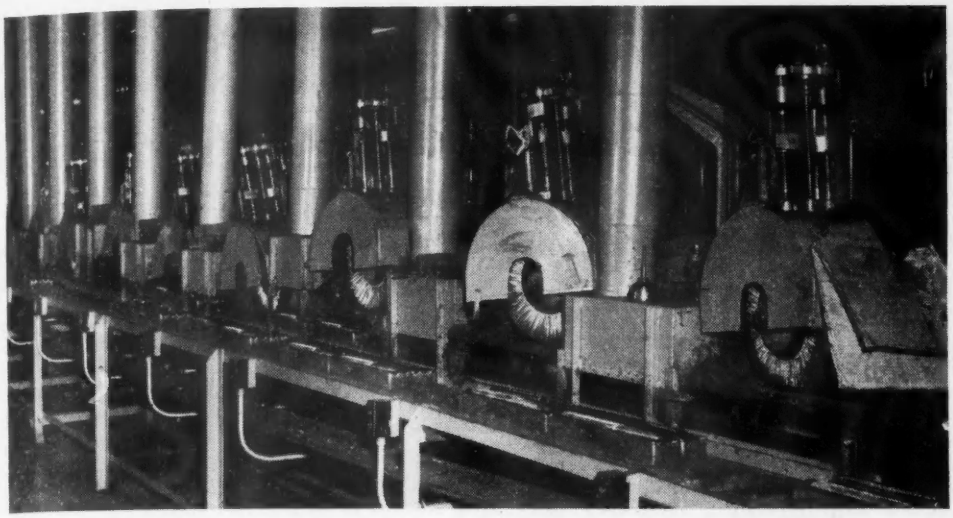


A bird's eye view of the hub cap painting arrangement. Here may be seen the T-shaped conveyor line with one paint spray booth at the extreme left, degreaser in the center, and the second color spray booth at the right.

AN INTERESTING example of further decentralization in General Motors Corp. is the new plant of its Brown-Lipe-Chapin Division in the western outskirts of Elyria, Ohio. With a floor space of approximately 370,000 sq ft, this plant extends greatly the scope of the operations of the B-L-C parent division located in Syracuse, N. Y.

It serves as a supplier to GM car building divisions, and was set up primarily for the manufacture of such items as hub caps, bumper guards of various forms and sizes, and a varied line of zinc die castings—including radio grilles and radiator grille sections. In addition to making production parts of this description for current models, the division also supplies service parts in any wanted quantities for older models.

The general arrangement of the plant houses three general types of activity—press shop operations, zinc die casting department, and an enormous electroplating set-up complete with accessory cleaning, spraying, drying, and plating functions. The plant may be said to be divided roughly into two main divisions (exclusive of the die casting department)—one for steel stampings for bumper parts; the other for stamping and processing hub caps. So far as possible the necessary equipment for each of these major functions has been grouped together and separated from



Perspective view of a portion of one of the long automatic polishing and color buffing machines on which the bumper bars are buffed after receiving the heavy copper plate.

the other almost to the same extent as if they had been housed in different buildings.

Heavy press equipment for bumper guards is arranged on one side of the building with presses in groups of two or three or four depending upon the nature of the work and the number of operations required. It is of interest to find that the conventional bumper guards of the familiar rounded form are made up of two pieces welded together. The practice here is to make two outer halves from one blank and two inner halves from another, parting and drawing and re-striking, if necessary, in separate operations. The two halves —outer and inner stampings—then are welded manually by means of the General Electric atomic-hydrogen arc welding technique. When polished and plated these parts show no signs whatever of a parting line and appear to be a single stamping.

On the other hand, a wide deeply drawn bumper guard for one of the divisions is made as a single stamping. The drawing operation for this part is done in a press of about 475-ton capacity. Lighter operations on other parts take place in presses of 175 to 200-ton capacity.

The zinc die casting department, near this press shop, features a battery of new die casting machines. All die castings are made from high-purity zinc Zamak No. 5 alloy. This department is now processing some large radiator grille bars, one of which is about 50 in. in length. To assure perfection of die castings the metal is bought on a certified analysis. In addition, however, samples are taken from every heat in each shipment and sent to the Syracuse metallurgical lab for spectroscopic examination to assure freedom from minute impurities.

Once the steel parts and die castings have been completed in their respective departments, they are routed to automatic polishing lines. Here the parts are fitted into fixtures that travel on a belt conveyor and move under polishing heads disposed to take the major areas of the work. Some

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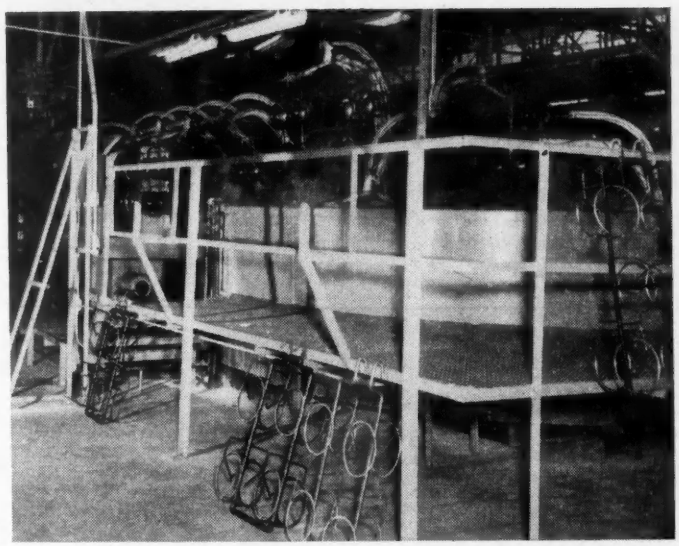
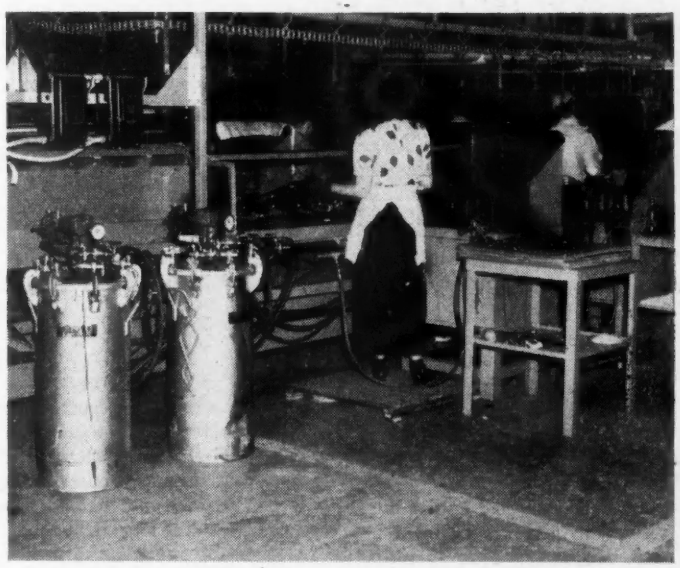


Fully automatic plating machine for hub caps is one of a number of these familiar installations found in the new plant.



View of a portion of the line for spraying steel and die cast parts as specified by the customer. The bumper guards and die castings are laid on the power-driven waist-high conveyor and move to the extreme left in the foreground. In this process the conveyor passes between small water-back spray booths such as shown at the three stations at the right. Work is picked off the conveyor by the operators, sprayed, replaced on the conveyor which then moves the parts through the infra-red lamp canopy at the extreme left for drying.

Engineers Becoming

Technical Papers on a Variety of Subjects

MASS production made engineers cost conscious, but inflated prices and materials shortages are making them more economy-minded than ever. This was evident at the 1948 annual meeting of the Society of Automotive Engineers, which was attended by over 3000 engineers, designers and company executives. Main attraction at the meeting, held during the second week of January at Detroit, was the technical sessions, 24 being scheduled for the five days with 48 papers on the program dealing with timely engineering studies on passenger cars, trucks, tractors, aircraft, engines, materials, fuels, lubricants, and transport.

During the week President-elect R. J. S. Pigott, chief engineer of the Gulf Development Co. and the first petroleum technologist to head the SAE, and the newly-elected committees organized for the 1948 term. At the annual business session it was voted to submit to the membership by letter ballot the proposed amendments to the SAE constitution. President C. E. Frudden submitted his report for 1947 and James M. Crawford, General Motors executive, who served as SAE president in 1945, was presented an SAE life membership.

Hundreds of engineers toured the exhibits of parts suppliers and equipment makers, some having on display new products in engines, piston rings, oil and gasoline filters, a mechanical-electronic instrument that provides a magnified chart record of minute surface irregularities at magnifications up to 10,000 and at tracing speeds up to 0.015 in. per sec., plastic sheeting for cabriolet tops, paper-fiber coated with resins for passenger car seat covers, plastic covered arm rests, and others.

Economy was an important theme in a number of the papers. Analyzing the factors involved in the selection of steels for automotive applications, W. E. Jominy, staff engineer at the Chrysler Corp., referred to the statement made years ago that "the most economical steel is not necessarily the one with the lowest first cost," which he said holds good today, pointing out that there is not much difference in the engineering properties of alloy steels so long as they are properly heat treated, the greatest difference in them being their difference in hardenability. C. L. Altenburger, research engineer of the Great Lakes Steel Corp., advised the judicious use of low alloy high tensile steels to permit more products to be made with the avail-

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Extra Low Pressure Tires for Passenger Cars

By W. E. Shively,
The Goodyear Tire & Rubber Co.

THE extra-low-pressure tire has greater enveloping power. Actual shock, as well as acoustical accompaniment is noticeably softened. This is reflected as better cushioning ability or improved ride in many ways:

1. A softer, smoother ride — less vibration and body shake on even roads that are considered good. Less shock and jolt passed up through the suspension system from the larger obstacles on bad roads, such as large expansion joints, and railroad crossings.

2. Absorbs more lateral shock. The modern suspension system is designed principally to absorb vertical shock.

There is very little in the suspension system to absorb lateral shock, except the tire.

3. Less mechanical upkeep, less wear and tear on the car, because of less vibration and better absorption of both vertical and lateral shock.

4. Rattles, particularly in convertibles and station-wagons, are noticeably diminished.

5. Less driver fatigue because of less vibration and road shock.

6. Improved ride is maintained better in high-speed driving, because the extra low-pressure tire runs 15 deg cooler at the critical point in the larger sizes, where tire temperature is a more serious factor. This results in one to two psi less pressure build-up from a cold start, at sustained speed, depending upon severity of conditions.

TABLE I—COMPARISON OF STANDARD TIRES AND EXTRA LOW-PRESSURE TIRES

Standard Tire Sizes	5.50		6.00		6.25		6.50		7.00		7.50	
E. L. P. Sizes		6.40		6.70		7.10		7.60		8.20		8.90
Section Diam. (in.)	5.65	6.40	6.25	6.70	6.50	7.10	6.80	7.60	7.35	8.20	8.00	8.90
Inflation Pressure (psi)	30	24	28	24	28	24	28	24	28	24	32	24
Load (lb)	825	825	915	920	985	990	1005	1090	1145	1225	1400	1410
Rim Diam. (in.)	16	15	16	15	16	15	15	15	15	15	15	15
Rim Width (in.)	3½	4½	4	4½	4¼	5	4½	5½	5	6	5½	6½
Overall Diam. (in.)	27.33	27.27	28.35	28.21	28.95	28.71	28.10	29.13	29.05	30.26	30.16	31.48
Loaded Radius (in.)	13.04	12.97	13.45	13.31	13.67	13.51	13.38	13.66	13.68	14.11	14.19	14.73
Weight—Tire and Tube (lb)	23.25	24.07	25.50	26.04	27.92	27.53	28.55	30.00	31.47	33.97	38.75	42.11
Air Volume (cu in.)	1345	1720	1650	1865	1915	2170	1920	2410	2285	2875	2670	3395
Tread Width (in.)	4.10	3.94	4.54	4.28	4.70	4.40	4.93	4.62	5.32	5.05	5.88	5.50
Rev. per Mile	758	761	734	738	718	724	736	715	721	687	705	659

The extra-low-pressure tire means a steadier, softer, safer, and more positive steering control on the open road, in turns, at all speeds, and on good and bad roads. It means better roadability, a better 'feel' of the road, and a feeling of security, which increases as more experience with a specific car is acquired. This advantage of improved car handling is reflected to the driver in many ways:—

1. A safer, steadier, softer steering control at all speeds, on all kinds of roads. This does not imply any deficiency in lateral stability. In fact, the larger extra-low-pressure tires on the proper wider rims increase lateral stability or cornering power five to eight per cent even at the lower pressure. This increased cornering power makes extra-low-pressure tires definitely superior from the standpoint of wander.

2. The car sticks to, or hugs the road better. The softer tires absorb and envelope road irregularities better; there is less bouncing over road irregularities and obstacles and, therefore, the car is actually hugging the road better. This better 'feel' of the road creates a confidence that you are going where you want to, when you want to.

More Economy-Minded

Featured at Annual SAE Meeting in Detroit

able steel tonnage and to contribute to greater durability of the end products.

On motor vehicle replacement Prof. Joel Dean of Columbia University told the transportation and maintenance session that the replacement of motor trucks is an economic rather than a technical problem in that it is more closely related to a company's budgetary control of internal investments than to such factors as age, mileage and depreciation. W. J. Cumming, of The White Motor Co., advocated that truck maintenance operations be placed in five groups based on mileage and life expectancies, so that lubrication takes place every 2000 miles, inspections and adjustments every 4000 miles, and that repair and replacement operations be undertaken on regular schedules of 20,000, 40,000, and 50,000 miles.

W. M. Holaday, director of Socony-Vacuum Laboratories, gave a thorough analysis of current problems with regard to the supply and consumption of petroleum products, their higher production costs, and the possibilities of obtaining high octane motor gasolines for future high compression engines (see Automotive Industries, Jan. 15, page 25). Due to the gasoline supply situation, he urged more efficient utilization of their octane numbers and suggested consideration of the following changes in engines to decrease their peak octane number requirements: (1) a momentary decrease in spark advance at low speeds as the car is accelerated, (2) improvement in intake manifolding to improve mixture distribution to cylinders, (3) use of rich mixtures during high power operation as currently employed in aircraft, (4) incorporation of a high slip coupling (probably hydraulic) to prevent low engine speed at wide open throttle, (5) improved combustion chamber cooling, (6) use of water injection, (7) and a dual fuel system to meet higher peak octane number requirements (see page 36).

Mr. Holaday's paper was discussed by four well-known research engineers — J. B. Macauley, Jr., Ethyl Corp.; J. M. Campbell, General Motors Research Laboratories; W. S. James, Ford Motor Co.; and W. E. Drinkard, Chrysler Corp. It was urged that the automobile and petroleum industries continue to exchange information and cooperate in solving this gasoline supply problem. Abstracts of other available papers presented at the meeting are given herewith:

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3. Safer, steadier, more positive steering on high-speed and rough turns. The car sticks to the road better and does not bounce or chatter around high-speed and rough turns.

4. Less wavering and sliding on drop-offs at the edge of the road, or along car tracks and similar obstructions. The larger, softer tire resists such obstructions less, and rolls over them easier.

5. Less mental and physical fatigue. Safer, steadier steering control relaxes the driver and demands less mental and physical strain, particularly in fast, long-distance driving.

6. In parking, extra-low-pressure tires, inflated to 24 psi, require seven percent greater steering-wheel torque than conventional tires at 28 psi. This is not discernible to the driver without a precise comparison on the same car under identical conditions. This difference is less on worn tires.

A comparison of standard tires and extra-low-pressure tires is given in Table I.

Application of Extra Low Pressure Tires to Passenger Cars

By G. H. Parker and Edgar Shay
Chrysler Corp.

STABILITY of a tire is closely associated with cornering power and probably should be discussed in terms of this latter characteristic. The cornering power of a tire is a measure of its ability to maintain the course along which the wheel and tire is directed—with a minimum of lateral or sidewise deviation when subjected to lateral loads such as are encountered when negotiating a corner, or as result from gusty side winds and changes in pavement lateral slope. The tire with the greater cornering power is considered more stable, and a smaller steering wheel motion is required for any needed directional correction.

If the new low pressure tire is installed on rims used for the old tire, its cornering power will be less than that of the old. Some increase in rim width will gain back this loss and a further increase will provide a stability in excess of that existing with the old tires and rims. Rim widths adopted for Chrysler for these new tires are in this latter class and the cornering power of the new tire and wheel combination is greater than that of the old. This is borne out by the fact that test drivers at Chrysler have frequently called attention to the superiority of the new tires when taking corners or curves at relatively high speeds.

An important property of the new tire with respect to cornering is its greater enveloping power—which means that the tire follows the road irregularities more closely with a consequent large reduction in loss of lateral traction. Most drivers well recognize the importance of this from their experiences in taking curves or corners at fairly high speeds where the pavement is rough or where the road is of the washboard type.

Other advantages of the low-pressure tire include: increased cushioning for better ride; reduced body shake; lower rolling resistance and slightly better fuel economy; improved flotation; less road noise; longer normal life; and improved life of many other car components. Disadvantages accruing from the use of the new low pressure tires are as follows: increased steering and parking effort; increased cornering squeal; blanketing of brakes; small decrease in performance; and increase in tire and wheel weight.

The Control of Materials by a Motorized Laboratory

By Henry A. Tuttle and George A. Nahstoll
Ford Motor Co.

AN ATTEMPT has been made to integrate more closely the facilities of the chemical engineering department at Ford Motor Co. with the demands of production by use of a motorized or mobile laboratory. Into this laboratory are incorporated facilities for a number of specialized chemical and spectroscopic analytical methods and standard physical tests. With this unit it is possible to make rapid-on-the-spot analysis of ferrous and non-ferrous materials without the need of transporting samples to the permanently located laboratories.

A standard 122-in. wheelbase Ford panel delivery truck was selected in which to mount the necessary equipment. As shown in Fig. 1, a work bench, contoured to fit the body shape, was built in along one side. The equipment used for the determination of the chemistry of materials consists of a semi-portable spectroscope, selected chemical spot test kits, apparatus for the determination of carbon by color, and a

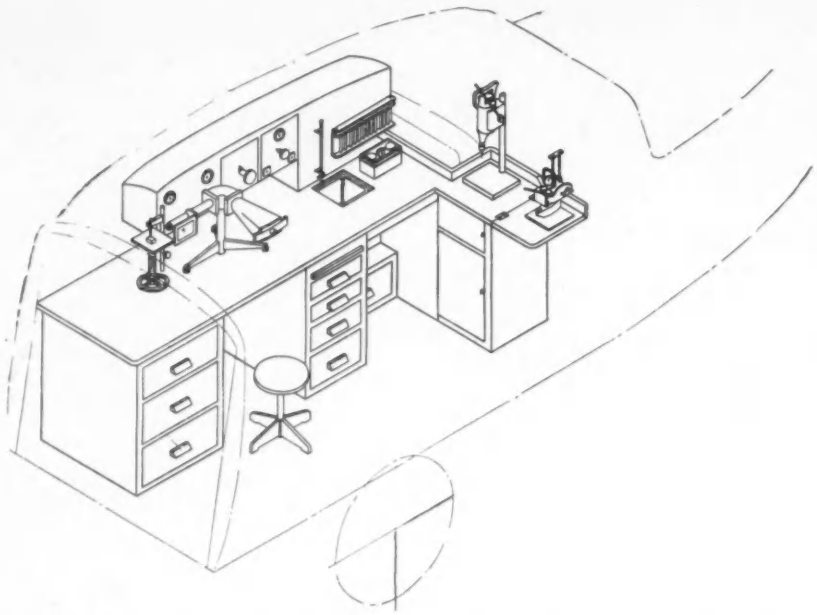


Fig. 1—Perspective drawing of the work bench and equipment in Ford's motorized laboratory.

portable high-speed grinder for spark testing. Hardness testers of the Brinell, Rockwell, and Scleroscope type and a magnetic plating thickness indicator compose the physical testing equipment.

Electrical power of 220-v direct current is furnished from a three-kw generator which in turn is driven by a power take-off unit mounted on the truck transmission. The generator is located in the cab beside the driver's seat. Single V-belts with a counter pulley serve to couple the power take-off unit with the generator. Sufficient power to drive the generator at 1800 rpm is obtained with an engine speed of about 1700 rpm. A control panel located above the center of the work bench permits remote control of the electrical circuits. An auxiliary starter button and ignition switch located on this panel can be used to start and stop the truck engine. When the laboratory is used indoors or near a suitable source of power, a connection can be made at the truck to use factory power. Power tools can be plugged in for use inside the laboratory or used with a reeled extension cord for moderate distances from the truck. A special current-limiting circuit is used as an excitation source for spectroscopic analysis. The spectroscope can be used outside of the truck with this circuit through a second reeled extension cord.

Practicable Usage of Low-Alloy High-Tensile Steels in Automotive Structures

By C. L. Altenburger
Research Engineer
Great Lakes Steel Corp.

THE corrosion resistance of high-tensile steels should play an important part in prolonging the life of automotive parts subject to corrosion over and beyond those of carbon steels. This principle has been made use of in several cases where corrosion has been costly and severe. The installations are comparatively new and no service data is yet at hand. However, the validity of the application is perfectly clear and sound. Specific applications have been fenders which are subject to not only corrosion but also to abrasion. Over two million have been made and are in service. Service records are being kept. The same procedure is being followed in numerous other automotive parts.

In some types of draws low-alloy high-tensile steels of good quality can be drawn just as deep as low-carbon steels. Thus, in the case of compression draws such as the drawing of a shell beneath pressure pads, reductions of 50 per cent from blank diameter to shell diameter in one operation are possible. This figure also holds for carbon steels. In the case of very soft, uniform carbon steel of about 35 Rockwell B this may be extended to 54 per cent. If the blank sizes exceed the above for flat bottomed shells the punch will push the bottom out. Where bottoms are rounded, as for instance with a spherical nosed punch, the reductions cited may be exceeded. By roughening up the nose of the punch so that tensile stresses are distributed over a greater area, the above depth of draw can be further exceeded. However, extending the depth of draw too far induces spring back forces which are tensile in compression draws, that are so high that a slight vibration or other externally applied tension will lead to vertical splitting. This point is reached when the amount of cold work is high enough to produce an elastic limit which is equal to the fracture strength.

Low-alloy high-tensile steels can be welded by all the processes which are used to weld carbon steels. In the case of resistance welding, including spot welding, higher pressures are required to bring the surfaces of the higher yield strength high tensile steels together, higher current values also are required. For the very best welds of optimum properties, cycle welds involving a post heat or pulsation welds are required depending upon gauge. For light sheet-steel gauges the first is preferred. Such welds are much stronger in both shear and tension than spot welds made in soft steels. For many applications single-shot spot welds have ample strength for the purpose intended.

Often the advantageous utilization of the higher elastic and tensile strength of low-alloy high-tensile steels requires designs such that mechanical instability does not ensue at loads or stresses which are independent of the properties of the material.

Where resistance to local denting is the sole desire, higher strength steels can be used advantageously. Here the comparative resistances are proportional to the entire stress strain diagrams. Roughly the force required to produce a given degree of indentation is proportional to the arithmetic average of yield and tensile strength. Where resistance to bending is of interest proportionality to yield strength is an approximate rule.

U. S. Naval Engineering Experiment Station Investigations on Cylinder Liner Wear

By Warren G. Payne and William F. Joachim
U. S. Naval Engineering Experiment Station

THE problem of excessive failure of standard cast-iron cylinders is not entirely one of wear because sufficiently low average wear rates, down to 0.0001 in. per 1000 hr have been obtained with some cast-iron cylinders in two moderately-loaded four-cycle engines to show that adequately low wear rates can be obtained as shown in Table II. However, a major problem exists in the tendency of cast-iron liner surfaces to wear by a form of fine-particle surface disintegration which may develop into complete failure of the surface with very rapid piston ring wear.

The cause for the disintegration type surface failure appears to lie in a metallurgical surface condition which may be largely formed by excessive heat, dragging and smearing during the machining operation.

Porous chromium plating on cylinder bores proved markedly superior to cast iron surfaces, not only because it furnished good corrosion and abrasion resistance, but because it protected the cast iron surface from disintegration wear. The tests showed that the average wear rate of 0.0006-in. per 1000 hr for porous chromium plating during comparative tests on six heavily-loaded two-cycle engines was only one-fourth that of non-plated cast iron in the same engines. The wear of the best liners in those engines averaged only 0.0001 in. per 1000 hours. The average wear rate of the poorest liners of 0.0011 in. per 1000 hr was only half

TABLE II—RELATIONSHIP OF WEAR TO MATERIAL IN CAST IRON CYLINDERS

Based on average wear rates for 168 cylinders in 18 diesel engines

Average Wear Rate, In. per 1000 Hr	Brinell Hardness	Heat Treatment		Cylinder Chemical Composition, Per Cent								
		Yes	Not Known	S.	C.	Si.	P.	Mn.	Cr.	Cu.	Mo.	Ni.
TWO-CYCLE ENGINES												
0.0037	210	X	...	0.10	3.15	2.35	0.08	0.80	0.25	0.04	.....	1.35
0.0031	220	X	...	0.14	3.25	2.35	0.18	0.70	0.63	.....	.....	1.25
0.0021	260	X	...	0.14	3.25	2.05	0.14	0.75	0.63	.....	.....	1.25
0.0019	590	X	...	0.12	3.38	2.15	0.25	0.58	0.68	1.25	.....	0.18
0.0015	590	X	...	0.12	3.38	2.15	0.25	0.58	0.68	1.25	.....	0.18
0.0014	210	X	...	0.10	3.15	2.35	0.08	0.80	0.25	0.04	.....	1.35
0.0010	460	X	...	0.12	3.38	2.15	0.25	0.58	0.68	1.25	.....	0.18
0.0010	260	X	...	0.14	3.25	2.05	0.14	0.75	0.63	.....	.....	1.25
0.0006	590	X	...	0.05	0.16	.....	0.04	0.55	.....	.....	0.25	1.83
FOUR-CYCLE ENGINES												
0.0024	240	...	X	0.13	3.38	2.00	0.25	0.60	0.55	1.25	.....	.....
0.0014	260	...	X	0.10	3.13	2.20	.....	0.81	.....	.....	.....	.....
0.0009	200	X	...	0.15	3.25	3.50	0.35	0.90	1.35	.....	.....	.....
0.0005	.....	.....	X	0.10	3.37	2.35	0.15	0.70	0.30	.....	.....	0.50
0.0004	250	...	X	0.10	3.40	1.80	0.20	0.60	0.50	1.75	.....	0.40
0.0003	500	X	...	0.10	3.25	2.28	0.20	0.70	0.83	.....	0.48	0.25
0.0003	220	...	X	0.09	3.10	1.70	0.25	0.85	.....	.....	.....	.....
0.0001	500	X	...	0.10	3.25	2.28	0.20	0.70	0.83	.....	0.48	0.25
0.0001	500	X	...	0.10	3.25	2.28	0.20	0.70	0.83	.....	0.48	0.25

the average wear rate of the cast-iron cylinders in the same engines. Chromium plating procedures are still not sufficiently developed because wear rates in one engine varied from 0.0005 to 0.0050 in. per 1000 hr at the top of compression ring travel where wear was greatest, resulting in a range of cylinder life from 24,000 to only 2400 hr.

Ceramic Bodies for Turbo-Jet Blades

By R. F. Geller
Chief, Porcelain and Pottery Section
National Bureau of Standards

REFRACTORY porcelains developed so far by the Bureau of Standards are definitely promising. With a tensile strength of over 15,000 psi at 1800 F, and over 10,000 psi at 1900 F apparently assured, there seems no doubt that, with regard to strength, porcelains can replace metallic alloys at temperatures above 1500 F. The porcelains also have excellent resistance to creep below 1900 F, at which temperature an elongation of less than 0.0003 per cent per hr was observed with a stress of 10,000 psi (see Fig. 2.) Another characteristic of porcelains is that they do not go into the so-called third stage of creep in which the rate of creep increases with time. Rather, under prolonged loading, they appear to become more resistant to creep. The picture is not without its flaws, however. It still remains to be determined whether or not these porcelains, or others to be developed, will have the necessary resistance to thermal and mechanical shock required for turbine blade service. Even though it should be found that they do not, it is practically inevitable that they will replace metals in other high temperature applications now being considered by automotive engineers.

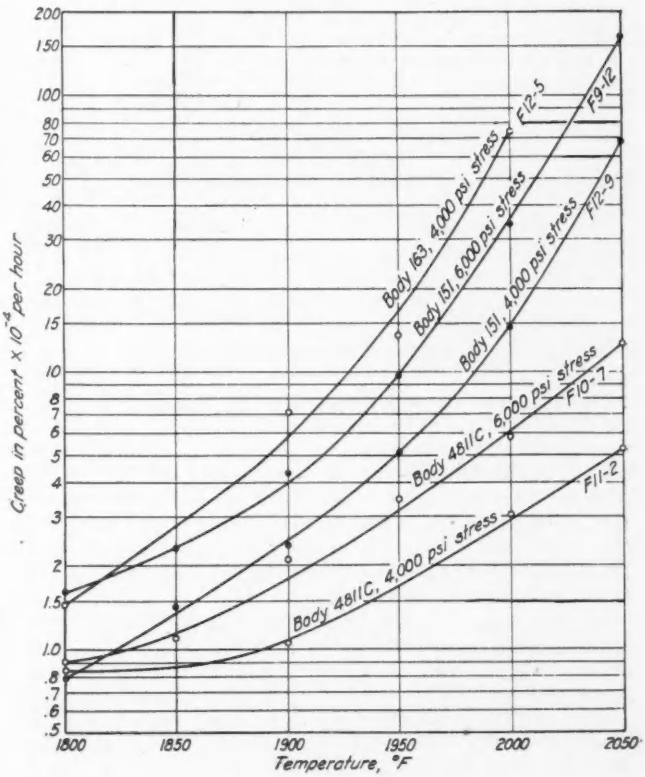


Fig. 2—Creep rate-temperature curves for a high-beryllia porcelain (4811C) and high - zirconia porcelains (151 and 163) under tensile stresses of 4000 and 6000 psi. Semi-log scale.

Engine Knock and Molecular Structure of Hydrocarbons

By Wheeler G. Lovell
Research Laboratories Div.,
General Motors Corp.

THE outstanding and perhaps the most important feature of the knock characteristics of hydrocarbons is the quite regular and consistent relationship between their tendencies to knock and their molecular structure or chemistry. Such relationships serve as readily remembered guides to find compounds of superior knock characteristics. They serve also as methods of estimating the value of compounds not tested, or as a reassurance that the field is fairly well covered. The latter result is an especially desirable one, because of the large number, estimated as high as several thousand, of hydrocarbon compounds in the gasoline boiling range which are possible of existence, and because of the new well-known fact that different compounds may show enormous differences in knock characteristics.

In order to examine such relationships between structure and tendency to knock, it is most convenient to divide

the hydrocarbons into ordinary chemical classes and for simplicity to consider the classes separately. It is also convenient to have some common basis of comparison of the compounds, or some set of engine conditions under which all the measurements are made. For this purpose the API data at 600 rpm, 350 F. jacket have been arbitrarily selected.

A general picture of the knocking characteristics of the paraffin hydrocarbons is shown in Fig. 3, where the critical compression ratio at which knock begins is plotted against the number of carbon atoms in the molecule, and where the values for the individual compounds are indicated by a simplified structural formula.

There are four important generalizations to be obtained from this illustration. The first one is the regularity indicated by the diagonal lines connecting the compounds. The ones going down to the right show what happens when successive carbon atoms are added to a straight chain; the ones going up to the right show what happens when the carbon atom is added so as to make a branch. These and other relations are so regular that by writing the formula of a paraffin hydrocarbon on paper, one can now make a good guess as to how it behaves in an engine.

A second general conclusion is that indicated by the position of n-heptane and iso-octane as designated on the chart. The range between them is the entire octane number scale, from zero to 100. But in terms of compression ratio, there are compounds which are as much better than 100 octane as 100 is better than zero. A generally adopted scale for measuring such good compounds does not exist, but it is known that it is possible to go to extremely high compression ratios or high supercharge pressures without knock with fuel components which are possible of existence.

A third conclusion is that it is known about where the upper limit of possible compounds lies. With the best compounds, such as triptane, spark ignition engines can be operated up to Diesel compression ratios without knock and with comparable efficiencies.

A fourth conclusion from such data is that it is necessary in thinking of the behavior of a fuel mixture such as gasoline, to consider its individual components, some of which may be very good and some very bad from the knock standpoint. Furthermore, even in thinking of its components it is necessary to make very fine distinctions. For instance, even in the octanes, which are all chemically C_8H_{18}, it is possible to have 18 different compounds which knock at compression ratios under some conditions from a little over 2:1 to as high as 15:1 even without the addition of tetraethyl lead, although physical properties such as boiling point, density and so on are practically identical for some of them. The differences lie in the way the molecule is made up.

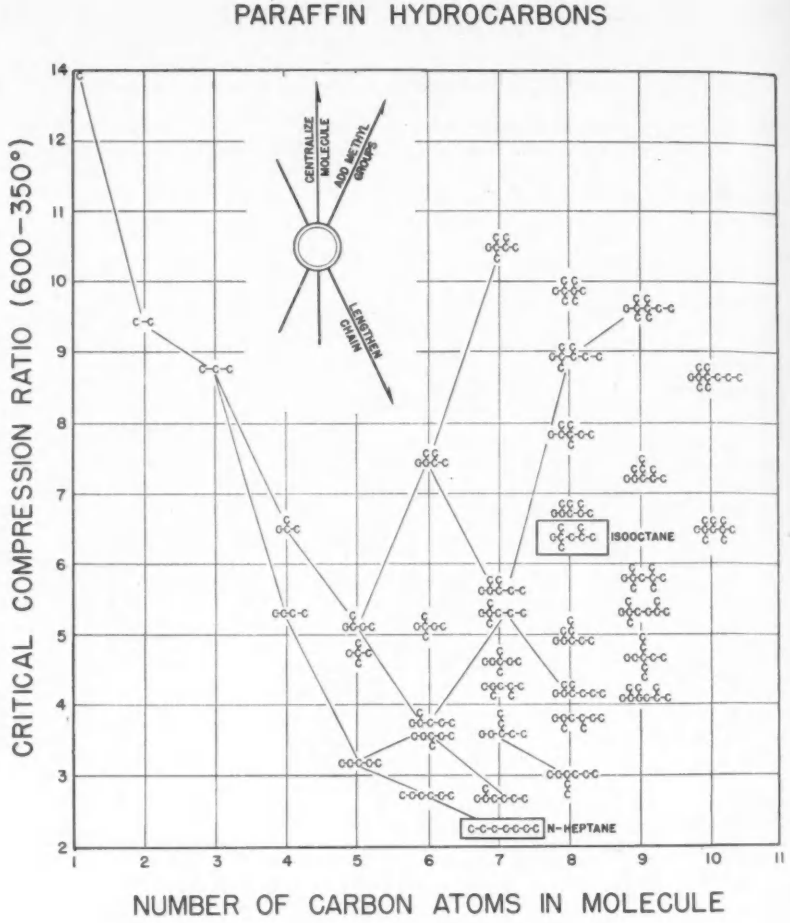


Fig. 3—Knocking characteristics of paraffin hydrocarbons.

Current Practice In Tractor Transmission Gears

By Wayne H. Worthington and Barrett G. Rich
John Deere Waterloo Tractor Works

In a study of eleven tractor transmissions, representing nine different manufacturers, it was found that the 20-deg full-depth is the predominating basic gear system. Four transmissions use it exclusively and two others in part. Stub teeth are used exclusively in one transmission and in part in another, but are apparently losing ground.

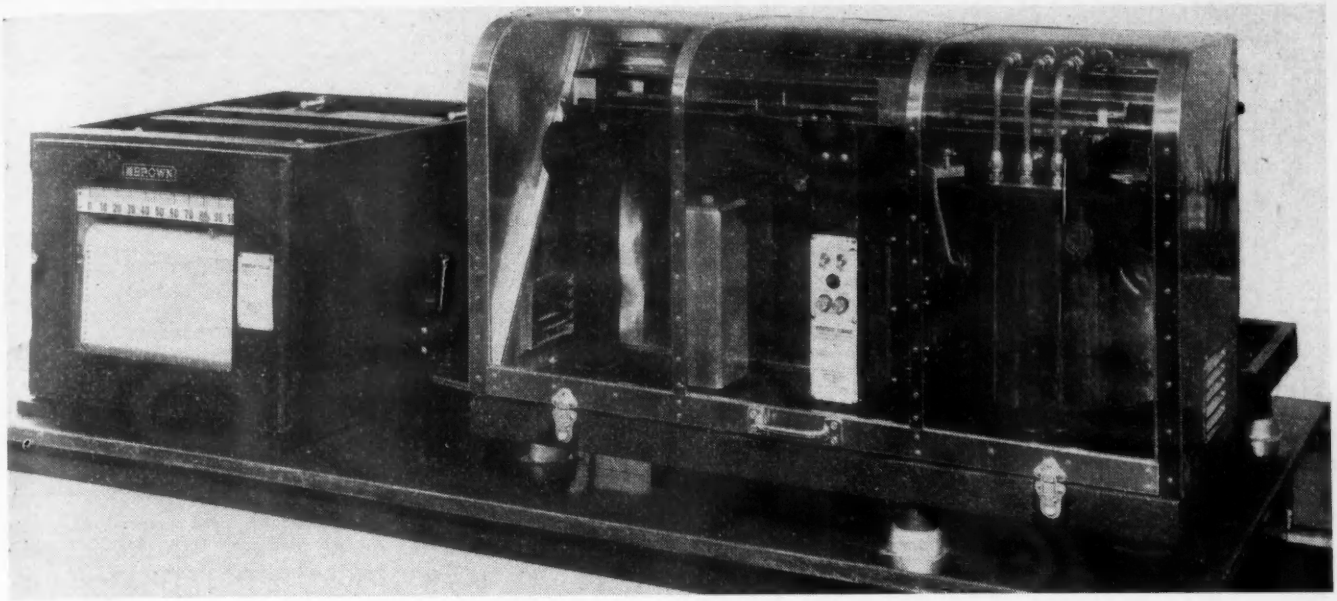
All but one of the users of 20-deg full-depth or stub teeth modifies at least one pair of those gears by the long-and-short-addendum method; the one user who does not modify has no 20-deg full-depth gear with less than 22 teeth, and does use another system with modification. The amount of modification of addendum varies; some modify by increasing the addendum height of the pinion by ¼, 1/3 or ½ and reducing the addendum of the gear by a corresponding amount. Others modify each pair as desired to secure a better balance of strength or improve involute action.

A 25-deg long and short addendum system is used by one manufacturer for the final drive in two designs representing both wheel and crawler practice. A 20-deg special depth system is used on one design. These are seven pitch gears; one gear of each pair has a seven pitch addendum and a nine pitch dedendum; the other has a nine pitch addendum and a seven pitch dedendum. This system combines in part the features of the long-and-short-addendum and stub tooth systems.

The 14½ deg variable-center gear system originally proposed by Buckingham in his book, "Spur Gears," is used by one manufacturer, exclusively in one design and in part, in the other. The 20-deg variable-center gear system is a later modification in which the tooth depths and clearance set up by Buckingham are maintained, but the basic rack has 20-deg pressure angle.

Some juggling of addendum and dedendum of basic rack and of tooth thickness of gears is necessary in order to use a common basic rack for all gears of a particular design, but experience shows that, as in the 14½ deg variable-center system, the strength of all gears in the system is well proportioned, and favorable tooth contacts and lines of action are secured. The length of the line of action measured in tooth intervals is somewhat reduced. Heavier loads may be carried with the higher pressure angle.

The remaining design employs helical gears throughout and is strictly a special gear system. The proportions are such that the teeth in the transverse plane have the same dimensions as 20-deg full depth standard spur gear.



The completed scale, showing a Brown single record, slow speed, strip chart electronic potentiometer. The instrument is temporarily mounted, prior to actual installation.

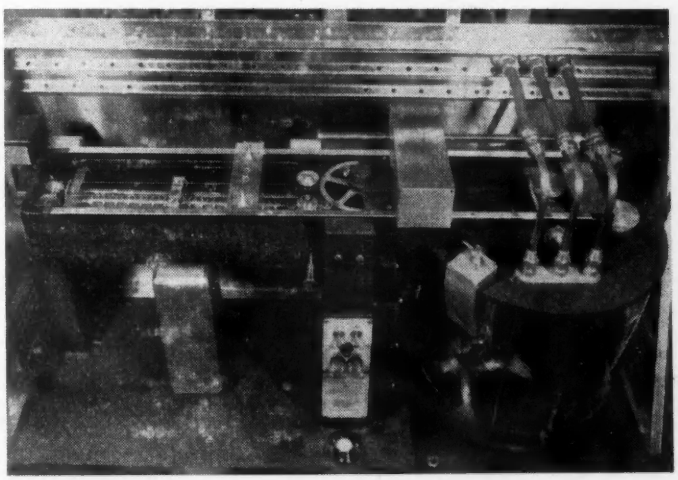
Accurate Method of Determining Engine Oil Consumption

By William S. Powell
Chief Engineer,
Laboratory Equipment Corp.

IN THE development or routine testing of an internal combustion engine under laboratory conditions the rate of lubricating oil consumption is an indication of the engine's internal condition. The more accurately this oil consumption rate can be determined, the more detailed and reliable is the analysis.

Many methods have been employed in attempts to measure actual total and rate of oil consumption in engines under specific operating conditions. A simple but inaccurate test is the "dip stick method" often applied to automobile engines. This method usually gives two distinct readings, "full and add oil." A more elaborate method is to periodically weigh the entire engine oil pan and oil when it is mechanically free from the engine and mounted on an appropriate scale. Between these two are many other common methods which involve weighing the oil itself.

The internal combustion engine in its present state of refinement has a relatively low ratio of total oil consumption to initial charge. Coupled with even slight experimental errors this fact makes accurate oil consumption-rate determination difficult and, unless exceptionally well done, misleading.



Close-up of the scale beam with cover removed. Incorporated is a Brown slide wire unit which, actuated by a motor, causes the weight on the scale beam to be accurately positioned as oil is consumed from the tank. The tank is suspended at the right. The motor drive is actuated by electric contacts on the scale beam, not visible in the picture.

Practically all acceptable laboratory methods involve weighing the oil. This method may involve weighing the new oil into the engine and, after sufficient running, stabilizing all operating conditions,

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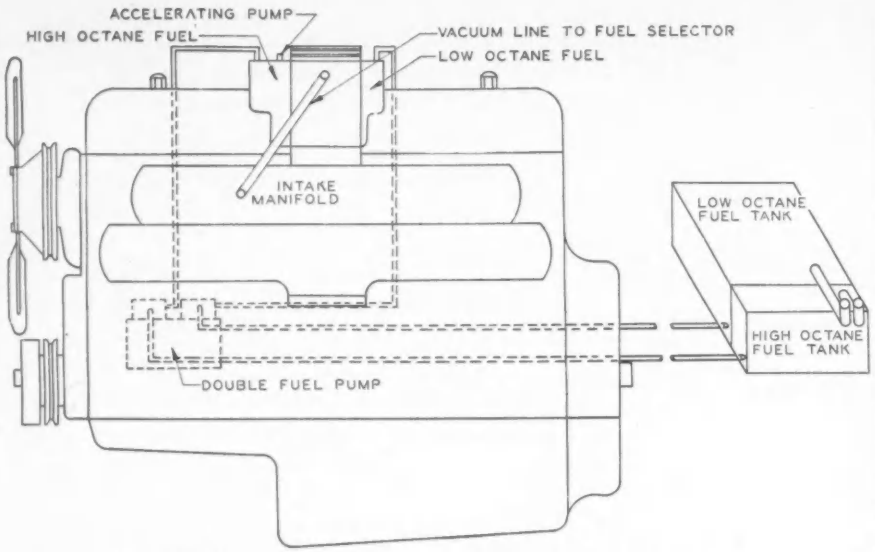


Fig. 1—Schematic layout of automatic dual-fuel carburetion system.

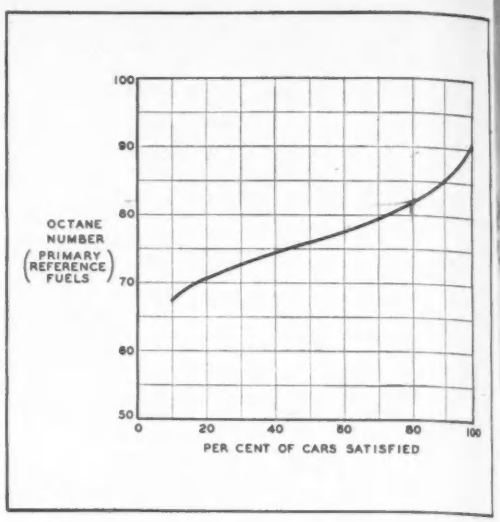


Fig. 2—Distribution of peak octane-number requirements for 81 passenger cars, 1946-1947 models.

Automatic Dual-Fuel System Saves High Octane Gasoline

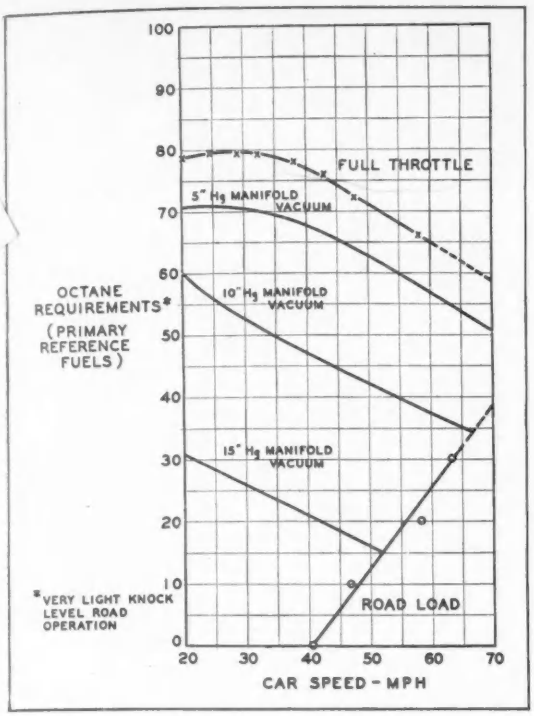
By Robert C. Mack

DEVELOPMENT of an automatic dual-fuel system for passenger cars, which would assist in solving the high octane-number gasoline problem for higher compression ratio engines, was announced recently by the Socony-Vacuum research and development department in Paulsboro, N. J. The system automatically meters two different grades of fuel in accordance with engine requirements as determined by manifold pressure, so that a high octane-number gasoline of sufficient anti-knock quality to meet peak requirements during full-throttle operation is consumed during only a fraction of the driving time. The other fuel, lower in anti-knock quality for normal cruising, is delivered to the engine the remainder of the time. Thus, the dual-fuel system would minimize the amount of high octane-number gasoline required to completely satisfy the anti-knock requirements of an engine.

An experimental version of the dual-fuel system, incorporating basic ideas of a two-fuel carburetor now being built, was demonstrated successfully on a 1947 Cadillac sedan by Socony-Vacuum engineers. The fuels used in the demonstration were a synthetic laboratory straight-run gasoline of 40 octane-number and a gasoline of about 76 octane-number. The 40 octane-number fuel is not available commercially, but was selected to give the desired octane spread. With the experimental installation on the 1947 Cadillac, consumption of the high octane-number gasoline did not exceed 20 per cent of the total, and complete freedom from knock without change in car performance was obtained.

The experimental dual-fuel system consisted of two separate fuel tanks, lines, pumps and carburetors—a complete fuel system for each grade of gasoline. The low or high octane-number fuel was selected according to the engine load as determined by the intake manifold pressure. The control during the demonstration was arranged so that the system shifted automatically to the high octane-number fuel when the manifold pressure dropped below four in. Hg. absolute. Similarly, when the engine manifold rose above four in. Hg, the high octane-number carburetor was shut off and the engine operated on the low octane-number fuel. The accelerating pumps on both carburetors were supplied with high octane-number fuel. Thus, the higher grade of gasoline was immediately available for sudden acceleration.

A special carburetor for handling both fuels, which is now being built by a prominent carburetor manufacturer, will greatly simplify the installation, it is reported. The arrangement will resemble a conven-



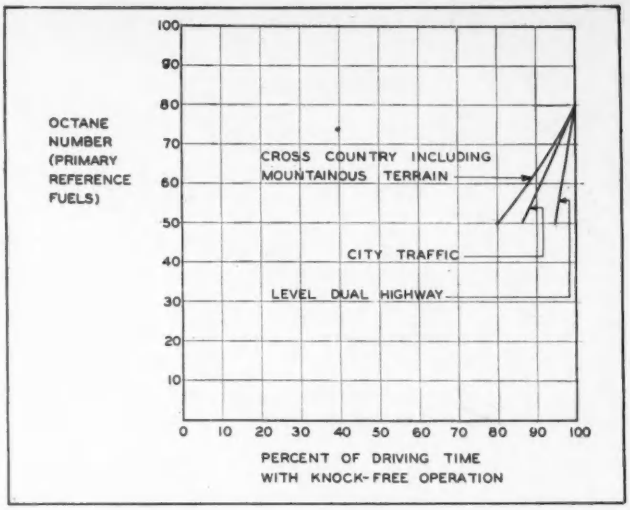

OCTANE NUMBER (PRIMARY REFERENCE FUELS)
CROSS COUNTRY INCLUDING MOUNTAINOUS TERRAIN
CITY TRAFFIC
LEVEL DUAL HIGHWAY
PERCENT OF DRIVING TIME WITH KNOCK-FREE OPERATION

Fig. 3 (Left)—Octane-number requirements of a 7.0 to 1 compression-ratio eight-cylinder 1946 passenger car.

Fig. 4 (Above)—Octane utilization with a 7.0 to 1 compression-ratio eight-cylinder 1946 passenger car.

tional carburetor in appearance, except that it will be somewhat larger in size since it will contain two separate float chambers. The manifold-vacuum-operated control system will be built into the carburetor, and will permit adjustment of the control setting and fuel flow. In this case also, the accelerating pump will be supplied with high octane-number fuel. The rest of the fuel system is visualized as consisting of a two-compartment fuel tank, a double fuel pump driven by a single eccentric on the camshaft, and two fuel lines from the fuel tank compartments through the pump and from the pump through the carburetor, as shown in Fig. 1.

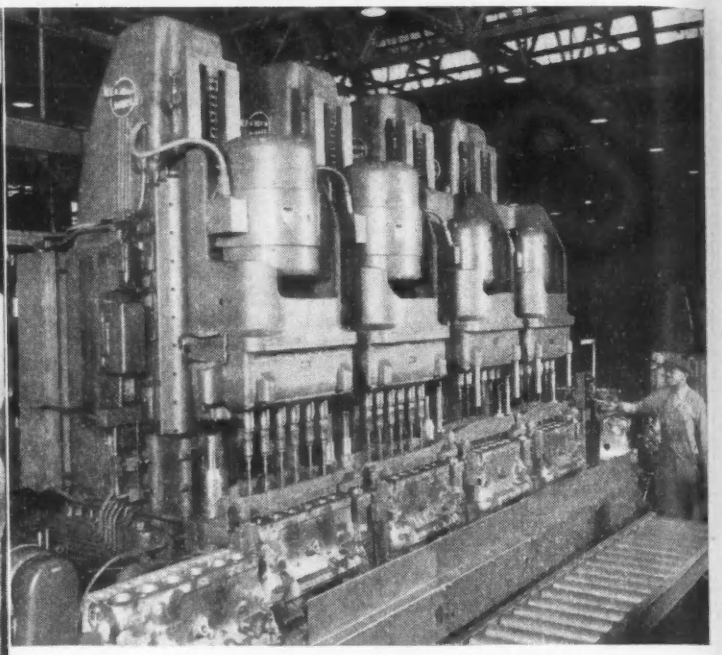
Development of Socony-Vacuum's dual-fuel system was prompted by exploratory work of their automotive research laboratory on the octane-number requirements of present day automobiles to determine how the economy of passenger car operation could be improved without loss in performance. After exhaustive road tests of several different types of passenger cars, W. M. Holaday, Director of the Socony-Vacuum laboratories, concluded that engineers of the automotive industry, instead of depending solely upon increases in the octane-number of gasoline for improved economy, should examine the manner in which the anti-knock quality of present gasoline is being utilized. He believes that automotive design and motor fuel marketing policies can bring about a readjustment of the spread in quality between the regular and premium grade gasolines to give, with present refining equipment, about 20 per cent of the premium grade needed, if the automobile industry produces engines of the experimental type now under discussion.

To determine the peak octane-number requirements of a typical present day automobile engine, a representative cross-section of passenger cars were tested with different grades of fuels for very light knock over the speed range under full throttle, in high gear, and under level road accelerating conditions. The data, shown in Fig. 2, were obtained in two independent surveys, using a total of 81 cars, 1946 and 1947 models. The curve shows, for example, that 80 per cent of the cars tested are satisfied by an 32 octane-number fuel, while 95 per cent are satisfied by an 87 or 88 octane-number fuel.

To determine part-throttle or road load octane-number requirements of the present day passenger car engine, one eight-cylinder 1946 car was selected as typical of the group tested, and was operated with various grades of gasolines. The curves obtained are shown in Fig 3. The octane-number requirements of this engine at full throttle and at road load are also given to illustrate the large differences in octane-number requirements at various throttle openings. As shown by the curves, this car, which had a higher than normal compression ratio, gave knock-free operation at speeds up to 40 mph under road load conditions on zero octane-number fuel. Also, it is shown that 30 octane-number fuel gave knock-free operations up to 63 mph.

To determine the per cent of total operating time that a passenger car engine demands a fuel meeting the peak octane-number requirements, several cars were operated on various grades of gasolines in city traffic, level open road and over mountainous terrain. Results for the typical eight-cylinder car discussed above are given in Fig. 4, which shows that fuel of 70 octane-number gave knock-free performance for 95 per cent of the driving time. This demonstrates the waste of anti-knock quality, since an 80 octane-number fuel is used in this car 100 per cent of the time to satisfy a five per cent peak requirement.

Close-up of twelve-spindle Ex-Cell-O precision boring machine for boring six-cylinder engine blocks prior to honing. These machines are installed in the air-conditioned department recently built to handle six-cylinder engine production.



Perspective view of the battery of four W. F. & John Barnes vertical, multiple-spindle drilling machines set up for fly-cutting the valve line.

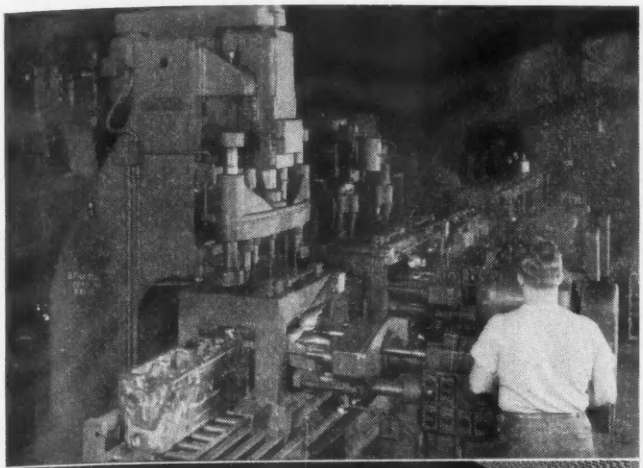
Ford Retools Cylinder Block Line

ANTICIPATING the introduction of the new six-cylinder engine for its motor truck line which was announced in January, 1948, Ford Motor Company recently completed the rearrangement and retooling of the cylinder block line. Although continuing its general manufacturing techniques, the company has raised the level of machine shop practice by the adoption of new transfer-type machines at various points along the line.

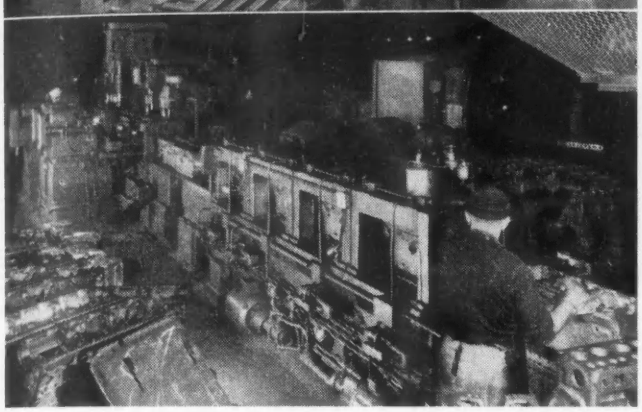
Contributing to this trend are some unique self-contained transfer-type Ingersoll milling machines; several rebuilt massive column-type Footburt drilling units which represent a form of transfer machine with rotary indexing rather than straight-through movement of work, and a battery of four W. F. & John Barnes drilling units tied together with a transfer-type conveyor. Supplementing these items of new equipment is a sizable battery of Ex-Cell-O "package" units for various operations. One group of three large multiple-station machines forms a transfer line for miscellaneous milling and drilling operations on the block. This high production cylinder block machining line represents an integration of scores of operations and features many machine tools of almost every description.

The initial milling stages are handled in rebuilt and reconditioned Ingersoll drum-type rotary mills, capable of maintaining high rates of production. Several new transfer-type Ingersoll mills have been installed, however, to speed up other operations. For example, the milling of the ends is done in an enormous transfer-type machine with three rough-milling cutters and a finish-milling cutter on the right hand side; one rough- and one finish-milling cutter on the left hand side. This machine, fitted with the familiar "Shear-Clear" cutters with cemented-carbide inserts has a through feed of 36 ipm and cutting speed of 250 sfm.

From a mechanical standpoint, a special two-station Ingersoll mill of four-spindle shuttle type is quite spectacular. In milling the manifold face and valve chamber cover face, it is necessary to vary the relationship between the work and the fixed cutters so as to clear certain interfering pads. To accomplish this, there is a massive box cam arranged near the top of the machine—on both ends. The cam outline is developed to give the proper clearance, the cam followers being actuated by work table travel, moving the

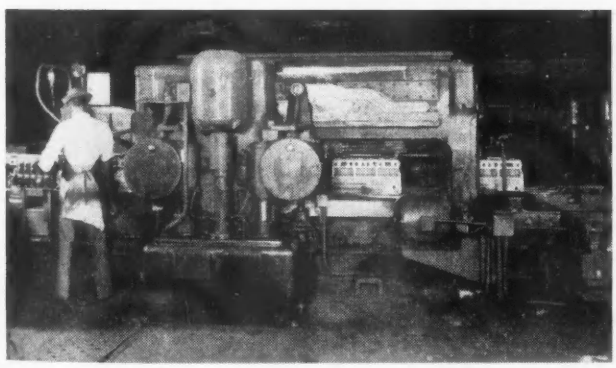


(Left) This is a front view of the group of three Ex-Cell-O transfer-type machines on the six-cylinder block line, linked by a common transfer-type conveyor.



Looking at the Ex-Cell-O six-cylinder block machining transfer line from the other end.

with Transfer Machines



Exterior view of the two-station Ingersoll transfer milling machine tooled for milling the manifold face. The detail of the cam track on the upper part of the machine may be seen at the right.

spindle cutters up and down to suit according to the contour of the casting.

Now we come to the group of three Ex-Cell-O transfer-type machines, each of which is a combination of relatively simple "package" units built on a common base with an interconnecting transfer-type conveyor. These individual self-contained hydraulic units are used in several sizes and mounted vertically, horizontally, or angularly as the case may be for driving single- or multiple-spindle heads. Electrically interlocked to operate in the established sequence, they have easily-adjustable cycles and can be arranged to operate at the most efficient speeds and feeds.

Work-holding fixtures in these machines are of identical design since the block moves through up-side-down for all operations. Work locating points on the pan face and the two dowel holes in the pan face serve to align the block in each fixture. An endless belt conveyor is built into the unit to take care of chip disposal by carrying chips to containers at the end of the machine.

The first unit in this group is a special three-way, eight-station milling, drilling, and tapping machine with the first station for loading, and the eighth for unloading. At the second station, the left unit rough-mills the oil pump mounting pad while the right unit mills the distributor mounting pad. The third station drills two holes on the left hand side and two on the right hand side. The fourth station drills three holes on the left and two holes on the right. The fifth station chamfers three holes on the left; on the right side it spot-faces and chamfers one hole, reams a 9/16 in. hole, and chamfers another hole. Station six is idle to permit inspection of the work. At station seven the left hand unit taps three holes; the right hand unit drills nine holes and taps another hole.

The second major machine in this group is a two-way, five-station, horizontal and angular drilling machine with station one for loading and station five for unloading. At the second station, the right hand unit drills five holes; the top unit drills six holes. At the third station, the right hand unit drills five oil holes to depth while the top unit chamfers two oil supply pipe bolt holes. At station four, the right hand unit drills five holes while the top unit taps two holes. This machine finishes some of the long oil lines which are drilled in two stages to relieve the load on the drill as well as to speed up the operation in a given station.

The third and last machine in this group is an Ex-Cell-O six-station automatic transfer unit with the first station for loading, the sixth for unloading. At station two the left hand unit finish-mills the oil pump pad, previously rough-milled in the first machine. Station three has a compound angular unit on the left hand side for drilling two holes to half-depth. At

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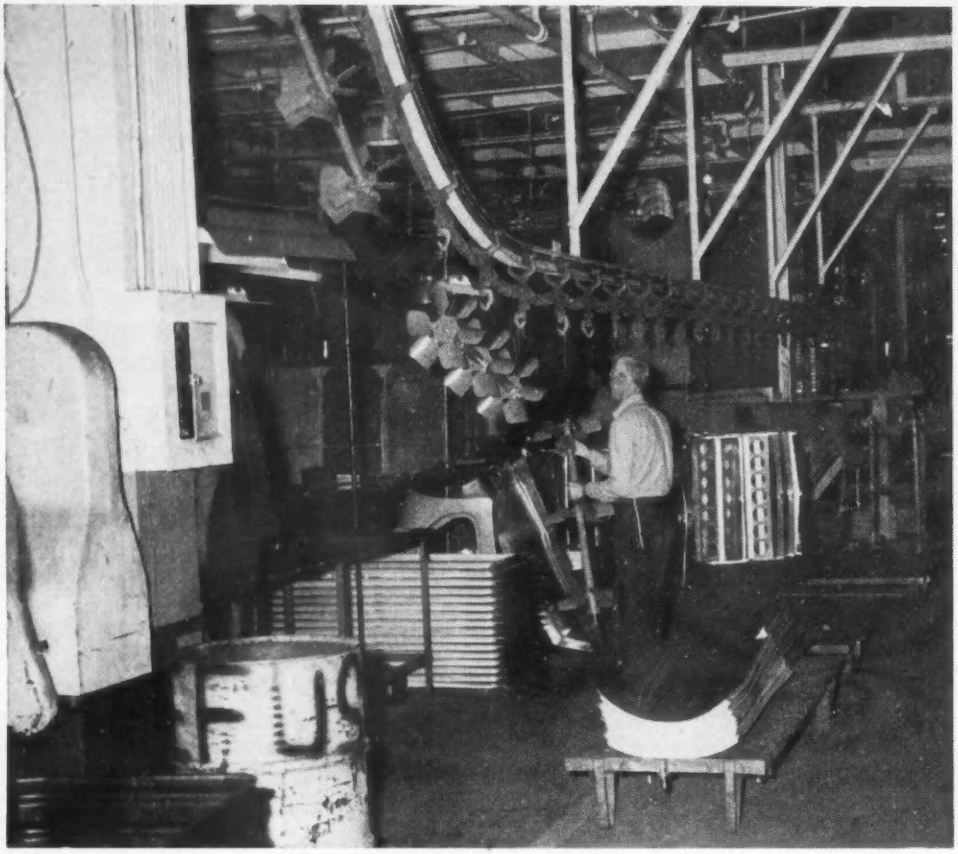


A 500-ft overhead conveyor expedites prime coating of many aluminum parts at Twin Coach. Here fan shafts are being unloaded after getting chassis gray enamel, baking in overhead infra-red oven, and then dropping down to sub-assembly storage area.

Twin Coach Develops Special Methods for Painting

By Walter Rudolph

WITH aluminum today constituting about 98 per cent of the structural material in motor coaches built by Twin Coach Co., this firm has developed some interesting procedures for painting aluminum. No small part of the attractive finishes, detailed according to customer preferences, is the satin-finished aluminum "belt" around every Twin Coach body. It shows to good advantage because of alumiliting process treatment.

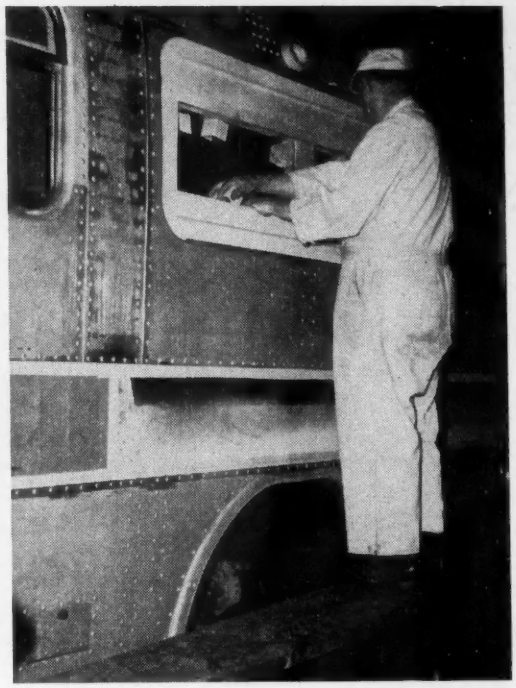
Fabricated aluminum parts are moved by hand trucks and Clark gasoline jitneys to the loading zone of 500-ft overhead conveyor. Steel wire hooks are used to hold parts. They proceed first to a phosphoric acid bath, and then a hot water rinse in a floor-level enclosure specially built for the plant. Leaving the cleaning tanks, pieces travel upward and across about 20 ft from them to a drying oven, maintained at 180 F, the line moving ten fpm.

A short distance from the drying oven, pieces enter a double set of 16-ft spray booths with water wash exhaust systems. The guns used depend upon the job at hand, but only two prime-coat colors are used, zinc chromate and chassis gray enamel, the last being specially suited for below-floor parts, either steel or aluminum.

Several manufacturers supply Twin Coach with paints, which come in 50-gal containers and are mechanically agitated before transfer to pressure tanks. From the spray booths, the conveyor line travels about 30 ft to the sub-assembly areas, first entering a 16-ft infra-red baking oven suspended from the ceiling. From this oven, the line travels 100 ft or so during the cooling interval. Then it descends and pieces are unloaded and "banked" adjacent to the sub and final assembly areas.

At the end of the coach assembly line, cleaning of the bodies is done with towels dipped into a liquid cleaner, the excess being wrung out and the coach

Every square inch of Twin Coach buses is hand-wiped with thinner, or cleaning fluid, before and after masking.



Wide, U-shaped clamps on aluminum masks hold them in position for protecting molding and windows themselves from sprayed paint. Note masks in position over aluminum "belt" just over wheel housing.

completely wiped by hand. Thus finger marks, dirty smudges and all excess alumilastic sealer is removed preparatory to masking. Twin Coach uses the Rex towel system for wiping cloths, paying rent and upkeep expenses and having towels picked up weekly.

Twenty-four in. Kraft masking paper and 1¼ in. masking tape are used in the masking operations. Lights, window molding, windows and the aluminum "belt" get masking, to name the most obvious areas.

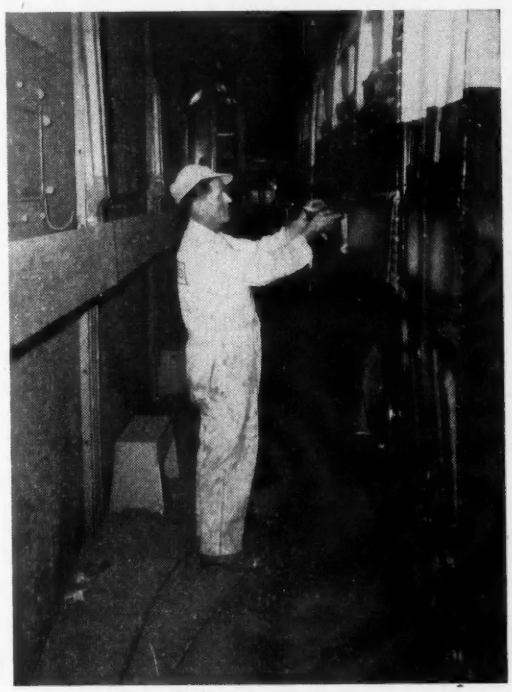
Aluminum Buses

Twin Coach has evolved a number of aluminum masks, using them over and over again, for this phase of finishing operations.

These aluminum masks have been fabricated with clamps for insertion in and over windows, and over the wide "belt," for instance. Then masking paper or tape is applied over the aluminum mask's edges, completely sealing the opening, if so desired.

The 12 by 36 in. aluminum masks for covering the "belt" are hung from wire clips that fit into drainage openings about a foot below the outside of each coach window. On the windows, the clamps are held in place with wide U-shaped pieces of aluminum, loosely riveted around the edges of the window clamps, and fitted over the window molding when masking is done. Thus, with periodical cleaning of the large and easily removed aluminum masks, a labor saving is effected and windows and "belt" are kept comparatively free of masking adhesive.

After masking, coaches get still another cleaning to make sure there is an absolutely clean surface for final painting. Visual inspection follows this cleaning, picking out areas that need zinc chromate spot priming.



Removing of masks after paint has dried in one of the ovens at rear of the Kent, Ohio, plant.

Since about 13 work stations have handled parts during the coach assembly, the prime is bound to be scratched or worn in some instances. Spot priming also gets aluminum rivets that show from final assembly work.

This spot priming with a spray gun is very light and sets in a few minutes. Coaches are now trans-

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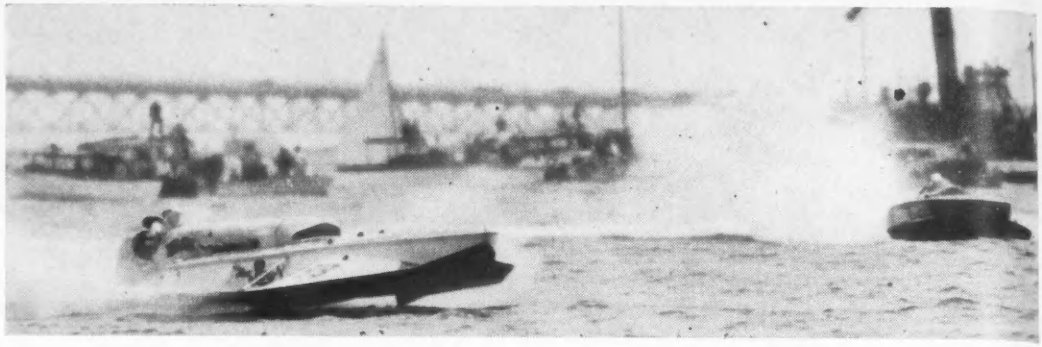


Motor Boat Show Sets New Records

A TOTAL of 236 boat builders, marine engine manufacturers and purveyors of nautical accessories and other equipment assembled in the Grand Central Palace, New York, from Jan. 9-17 for the 38th National Motor Boat Show. Records of the National Association of Engine and Boat Manufacturers, sponsors of the event, revealed that this established a new record for numbers of exhibitors participating and number of boats displayed. It was estimated that new attendance records also were set during the course of the show's eight-day run.

The formidable fleet of large and small boats gathered under the roof of Grand Central Palace was made up of 34 cruisers from 21 to 42 ft in length; 28 sailboats, including models for racing and for leisurely cruising; and nearly 200 inboard and outboard runabouts and utilities to suit every purpose. The big cruisers included a 42-ft boat from the Owens Yacht Co., which featured three distinctly separate cabins, and a wide range of hulls by Consolidated, Elco, Higgins, Luders, Matthews, Richerdson, Truscott and Wheeler.

Medium sized cruisers, with an average length of less than 30 ft, comprised a fleet including sedans, sport cruisers, day cruisers and sport fishermen. In addition to most of the builders showing larger craft, exhibitors in this category included Churchward, Davis, Emancipator, Marine Engineering, Ventnor, Western and Zobel's. Many of these firms also showed de luxe run-about speedsters and eye-pleasing utility boats.

Greater Use of Aluminum and Plywood

Materials-conscious visitors to the Motor Boat Show were given an insight into modern production methods that should banish the ancient concept of a boat builder as a craftsman who spends much of his time scouring the woods for natural crooks readily usable for knee, frame and steam timbers. The most widely adopted new departures in the use of materials for hull construction of sailing and power craft designed for pleasure stem from the increased popularity of aluminum among builders who specialize in metal, and of various types of plywood on the part of those who prefer to utilize lumber in its most up-to-date form.

On the basis of construction trends and sales since the war, steel hulls have become acceptable in certain types of medium-sized cruisers and one-piece molded plywood reinforced with plastic has proved well suited for dinghies, power runabouts and one-design racing sailboats.

Aluminum, which is being processed into spars for an increasing number of sailing craft where the designer seeks to save weight aloft, has already proved its worth for minimizing hull maintenance in lightweight dinghies, rowboats, canoes and utility craft. Sailing vessels from 18 to 35 ft have been built of aluminum in the past year.

Forty-Two Engine Exhibits

The 42 individual engine displays offered a wide variety of power plants ranging from featherweight outboard motors of low horsepower to a Diesel engine that tipped the scales at better than 10 tons.

Major developments this year included many individual approaches in working out cooling system refinements, with improved thermostatic controls permitting engines to be operated at proper temperatures under varying conditions. There was also a new emphasis on various types of easy-to-operate throttle and clutch controls.

Handy outboard engines in a variety of sizes designed to meet the requirements for a wide range of craft in the small boat category were displayed by nine of the country's leading manufacturers in this field of the marine industry.

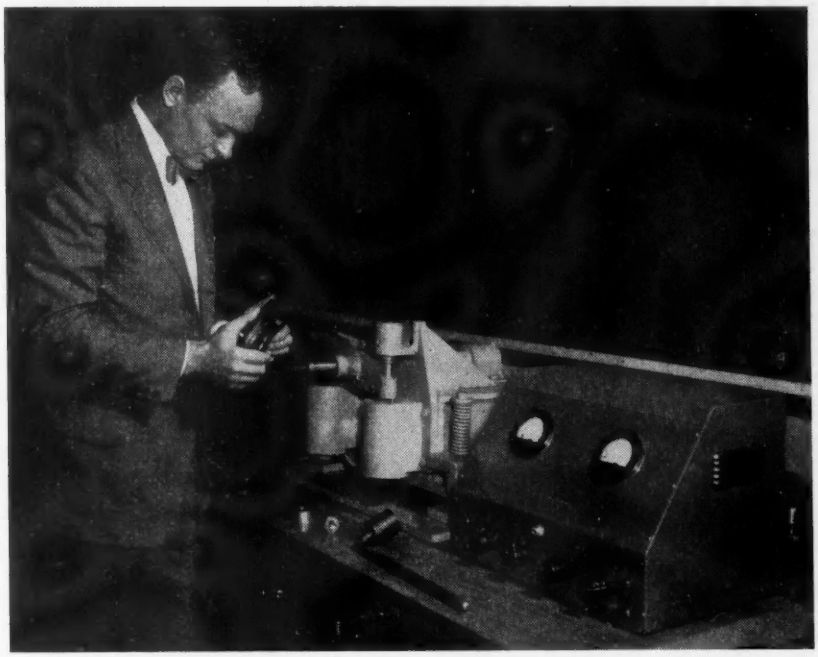
The outboard exhibitors were Champion Motors

(*Turn to page* 45, *please*)

Ford Develops Device for Testing Viscous Dampers

WITH the adoption of the viscous type torsional vibration damper by Ford Motor Co., it was found necessary to change the method of testing dampers because of the difference between the viscous and the conventional friction disk types. The latter type has been tested with a fixture designed to measure the torque required to break the friction disks free and, when once free, the torque required to keep one set of disks moving relative to the other.

In the viscous damper (see AUTOMOTIVE INDUSTRIES, Dec. 1, 1947, page 24) which is a sealed unit, there is a slight clearance between the flywheel and case, the space being filled with Silicone fluid. Since this construction makes it impossible to rotate the internal flywheel directly, it was, therefore, necessary to develop an indirect method for production testing. The investigation at Ford led to the design of a special method which has proved so successful that the company's engineering department has recommended its use for testing all torsional vibration dampers whether of viscous or friction type. This method measures true damping ability rather than a secondary quantity such as slipping torque, the absolute damping factor being considered as the real merit rating of a damper. The same device when used for experimental work can be employed to vary the exciting torque over a wide range to show damping ability of different designs at various amplitudes.



Illustrated here is the testing device for production acceptance of torsional vibration dampers. The horizontal shaft at the left is shown exposed ready for installation of a damper for testing. In the cabinet at the right, the left hand meter indicates power output of the amplifier and is calibrated in arbitrary units. The right hand meter shows amplitude of vibration of the shaft and is calibrated in degrees of double amplitude from 0 to one degree.

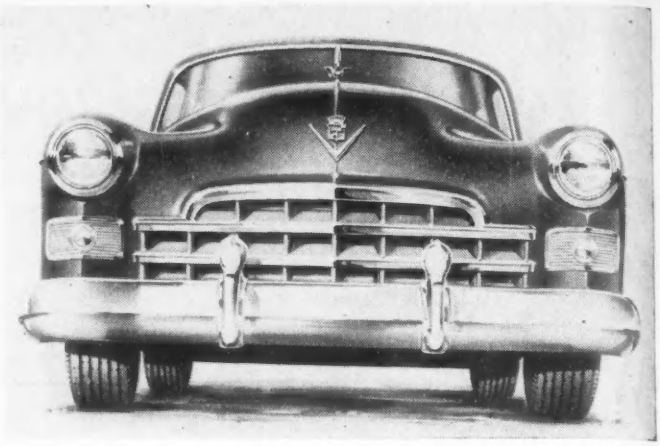
Primary purpose of the testing device is to enable inspectors to measure relative damping ability of production dampers so as to reject those which fall below a certain minimum value. The criterion is established by comparing amplitudes of vibration, with constant exciting torque, of a test damper and a master damper.

The Ford test method follows the physical law that the amplitude of vibration of a torsional pendulum depends upon the amount of exciting force used to keep it oscillating and upon the degree of damping present. For tests on vibration dampers, the operating (resonant) frequency of the pendulum was chosen to be close to that of the crankshaft of a typical six-cylinder engine, as found from torsional vibration surveys. This is at about 250 cycles per second with a damper mounted on the free end of the pendulum. Mechanical losses in the vibrating system were reduced to a minimum in order to concentrate as much damping as possible in the test piece. An electromagnetic exciter unit was developed, capable of driving the pendulum (without damper), to vibration amplitudes similar to those experienced in the engine (without a damper). This unit also includes circuits which measure the exciting torque and the vibration amplitude and indicate these values on meter scales.

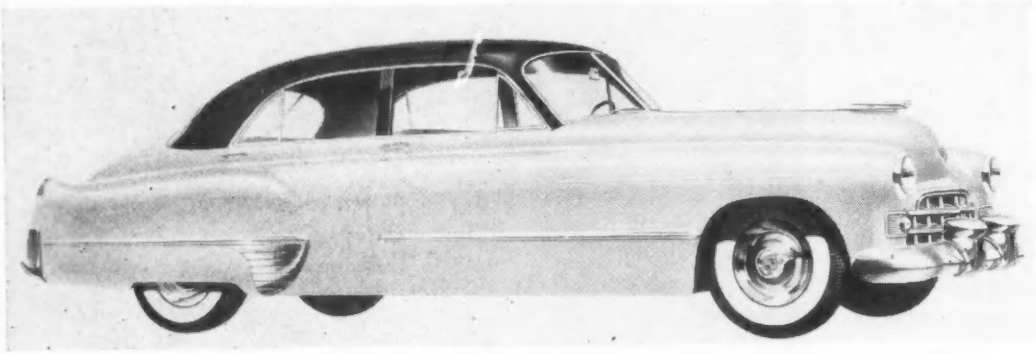
As illustrated, a horizontal shaft is fixed securely at one end to a heavy box-frame base. Two driving arms are attached to the free end of the shaft, and a magnetic exciting coil mounted below the end of each arm. The free end of the shaft is machined to provide a place for mounting the dampers to be tested, or the "dummy damper" as the case may be. With the damper or dummy in place, the shaft assembly is a simple torsional pendulum. The heavy base of the device is supported by a spring suspension system which isolates the unit from any table on which it

(*Turn to page* 66, *please*)

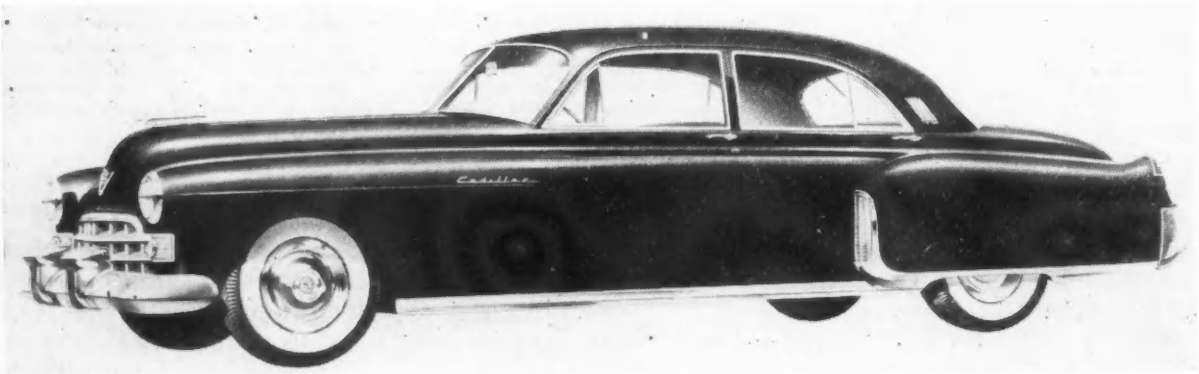
Cadillac's Svelte Surge Styling for '48



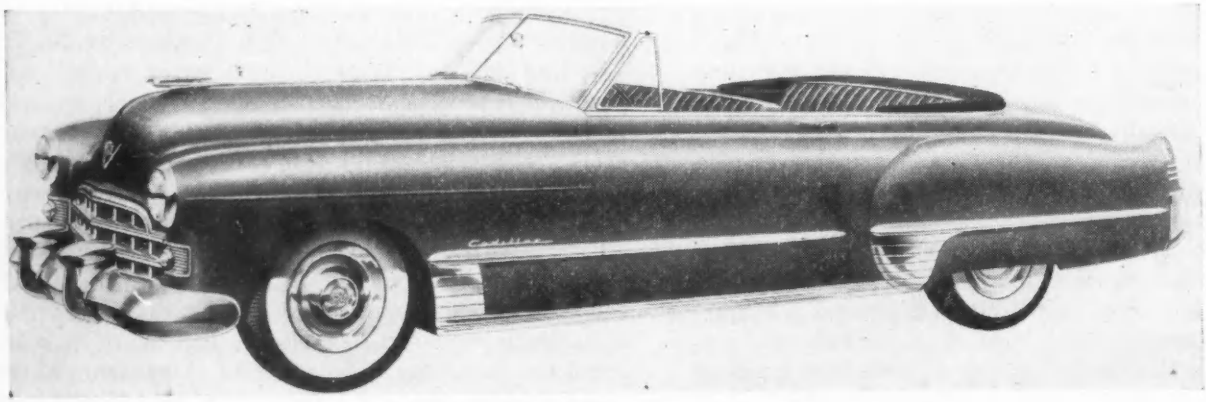
Cadillac's new styling for 1948 emphasizes its traditional low silhouette. The radiator grille consists of two horizontal chrome-plated bars, divided by seven vertical fins of stainless steel. Four models will be offered—the 61 and 62 with 126 in. wheelbase, the 60-S with 133 in. wheelbase, and 75 with 136¼ in. wheelbase. All driving instruments are grouped in a compact cluster above the steering column and just ahead of the steering wheel. Lower edge of the panel is carried downward and forward to the front edge of the toeboard. Windshields have curved glass.



Series 61 four-door sedan.



Cadillac's svelte surge styling for 1948 is accentuated by this Series 60-Special four-door sedan.



The convertible coupe in Series 62.

Motor Boat Show

(*Continued from page* 42)

Co., Minneapolis, Minn.; Evinrude Motors, Milwaukee, Wis.; Johnson Motors, Waukegan, Ill.; Kiekhaefer Corp., Cedarburg, Wis.; The Lauson Co., New Holstein, Wis.; Martin Motors, Eau Claire, Wis.; Metal Products Corp., Milwaukee, Wis.; Muncie Gear Works, Inc., Muncie, Ind., and Scott-Atwater Mfg. Company, Inc., Minneapolis, Minn.

The Champion, Evinrude, Johnson, Lauson, Martin and Scott-Atwater motors bear the name of the manufacturer. Kiekhaefer builds the Mercury line, the Metal Products Corp. markets its engines under the trade name Flambeau and the engines turned out by Muncie are designated as the Neptune line.

Brennan Motor Manufacturing Co., of Syracuse, N. Y., introduced a new series of powerful little four-cylinder engines of extraordinary light weight known as the Imp series.

The Imp, which weighs only 170 lb yet pulls 10 to 25 hp, and the Imp Junior, producing 25 hp and weighing only 160 lb, are especially suitable for converting outboard hulls to inboard power. They come in two distinct models, each of which is supplied in both direct and built-in reduction drive. The custom models have special equipment such as a vertex magneto instead of the commonly used distributor, a heat exchanger and other refinements.

The Buda Company, of Harvey, Ill., exhibited seven models of Buda marine Diesel engines varying in size from 40 to 300 hp and a newly developed Diesel electric marine generator set. Among these engines was Buda's latest, a completely new postwar product in the form of an eight-cylinder, heavy-duty engine designed to produce 300 hp at 1100 rpm. This engine is equipped with special reverse and reduction gear and the heat exchanger system of cooling.

Another new Buda effort was a 15 kw Diesel generator set for auxiliary service afloat. The unit is compact, complete with controls and is mounted entirely on its own base. The engine which drives the generator is one of a new BD series of high-speed, low-bulk, low-weight engines.

A new 80-hp engine and a 115-hp engine were displayed by the Caterpillar Tractor Co., of Peoria, Ill.

The newest addition to the Champion Motors Co. line of outboards, an alternate firing twin-cylinder engine developing 7.9 hp at 4200 rpm and weighing only 47 lb, was also introduced to the public at the Show.

The 20th anniversary line of Chrysler marine engines, two variations on each of three basic models, were included in the exhibit of the marine division of the Chrysler Corp.

The line comprised three flywheel forward engines of 92, 115 and 141 hp and three engines of similar hp ratings with the flywheel aft.

New General Motors Diesel

The most recent Diesel engine development by General Motors, a two-cycle twelve-cylinder, 1200 hp power plant for deep sea vessels was shown by the Cleveland Diesel Engine Division of the parent company.

The Cummins Engine Co., Inc., Columbus, Ind., displayed an actuated cutaway version of a supercharged NHS-600 model. This supercharged engine rates 132 hp at 1800 rpm in continuous heavy-duty operation and a maximum of 200 hp power at 2100 rpm. It was shown with a Twin Disc 4.38 to 1 reverse and reduction gear. Other Equipment includes heat exchanger, water-cooled exhaust manifold, variable speed Woodward hydraulic governor, twin disc front power take-off, centrifugal bilge pump, electrical starting system, oil cooler and mounting rails.

The most significant advancement in the 1948 series 71 marine propulsion engines which the Detroit Diesel Engine Division of the General Motors Corp., displayed was the introduction of 1-to-1 gear ratio models in three, four and six cylinder sizes that replace all of the old direct drive units.

Another change is the enlargement of cylinder liner intake ports to provide better scavenging and cleaner burning of fuel with the result that smaller output injectors can be used to produce comparable horsepower. This improvement is said to have resulted in increased operating efficiency and fuel savings up to nine per cent.

A new Evinrude Sportwin engine, embodying a number of unusual features, headlined the huge mezzanine floor display. Built by the Evinrude Motors Co., Milwaukee, Wis., the engine is an advanced design of twin cylinder, alternate firing type, incorporating a new development in carburetion that provides extreme flexibility and exceptional smoothness at every speed. The engine develops 3.3 bhp at 4000 rpm. There is no fuel vent or shut-off to open and close when starting or stopping the engine. The carburetor adjustment lever performs these tasks automatically. There is also a new type fuel filler closure which greatly simplifies fueling. The filler cap is lever-locked and leak-proof.

Gray Line of 26 Engines

A total of 26 gasoline engines built around seven piston displacement sizes and four Diesels, including a big, new six-cylinder engine, will be offered in 1948 by the Gray Marine Motor Co. Gray gasoline engines are sub-divided into four distinct groups for as many different types of service. The Luggers are for working speeds up to 2400 rpm. Express series for 3200 rpm. Phantom to 3600 rpm and Fireball to 4000 rpm.

Major developments center about the cooling system. The engines with direct cooling have Gray's gear-driven seawater pump with Neoprene impellers, used in connection with the "thermogard" automatic temperature control device. Closed system of fresh water cooling is standard on all Gray Diesels and available on all gasoline models except the smallest fours.

Engines with this equipment have a centrifugal circulating pump which requires no lubrication or priming. Two options of heat exchanger, inboard or outboard, are available. The latter has a copper keel cooler, instead of the conventional water scoop, to provide direct contact with seawater and to eliminate necessity for a seawater pump.

Gray also presented a new sealed unit instrument panel which includes a register of engine operating hours and an automatic flash indicator of excessive engine temperatures, operated electrically by thermo-couple.

The Lathrop Engine Co., Mystic, Conn., introduced a new super-six engine. Known as the LH-D6 Super model, this is a six-cylinder machine of 339 cu in. piston displacement rated at 132 hp at 3200 rpm. It is available in direct drive and three different reduction gear ratios.

Martin Introduces New Model

Martin Motors, of Eau Claire, Wis., a firm which established itself in the outboard sphere with two twin-cylinder, alternate firing type engines, presented a smaller counterpart of these successful machines. The new model Martin is a 2⅓ hp engine weighing 29½ lb and embodying in its single cylinder construction all of the engineering and workmanship of its larger predecessors.

The Metal Products Corp., Milwaukee, Wis., which moved into the outboard engine manufacturing field a year ago with the 2½ and five-hp Flambeau engines, introduced a new model, a larger and more powerful version of the two already established performers.

Two new engines made their debut in the display set up by the United States Motors Corp., Oshkosh, Wis. The new one-cylinder motor was a water-cooled job in two models, 1¾ hp at 2800 rpm., and a seven-hp unit turning at the same speed. These compact engines, made for small boats or used as auxiliaries, are available in direct drive or with built-in clutch.

For the family boat, U. S. Motors has added a handy, smooth-operating, 10-hp, two-cylinder engine of the medium duty class.

Three types of industrial trucks used to handle material at the Chevrolet Gear & Axle Plant, Detroit, are shown in operation in this picture. At the right a tractor pulls a dump-tram carrying a 3000 lb load of small castings. In the middle is seen a fork truck moving a strapped-to-pallet load of truck axle housing (approximate weight 3200 lb) from out-of-doors storage into production area. In background a lowlift platform truck moves an incoming load of passenger axle shafts from receiving department into storage yard According to Chevrolet's plant engineers use of palletized loads and battery-powered fork trucks, has resulted in approximately 50,000 lb of material being handled per man-hour, as against only about 4000 lb per man-hour under old manual methods.

Many New Designs at Materials Handling Show

STREAMLINING, the use of lighter weight metals and the introduction of mechanized equipment and accessories designed to eliminate the use of pallets in certain heretofore palletized handling operations, were among the highlights of the Second National Materials Handling Exposition, held in Cleveland, Jan. 12-16. This year's show, occupying three times the display area of last year's exposition, was held in Cleveland's huge Public Auditorium and was participated in by 202 manufacturers of materials handling equipment. The total registered attendance, including exhibitors, was 15,500.

Technical sessions, headed by materials handling experts, and held concurrently with the exposition, emphasized the economies realizable through the use of modern mechanized handling equipment and techniques. These technical sessions included forum discussions which revealed widespread interest in the uses of materials handling installations as a means of combating inflation through lowered production and distribution costs. A dramatized presentation, "From Source to Consumer," demonstrated the importance of integrating and coordinating the related activities of receiving, processing, warehousing and shipping. This presentation, which packed the huge auditorium arena with interested spectators, was arranged by the management in association with The American Society of Mechanical Engineers. It stressed the fact that since handling adds nothing to the value of goods, management should give more attention to the substantial savings which are possible through the use of mechanized equipment which functions at those points where one productive or distributive activity connects with the other productive or distributive activity.

The application of materials handling equipment and techniques in widely diversified industries also was illustrated in the Materials Handling Theatre which exhibited special industrial motion pictures, sponsored by various manufacturers of equipment.

'New Look' Equipment

Some of the exhibits featured the "new look" in materials handling equpiment. This streamlining, according to some exhibitors of "new look" equipment, was a definite improvement since it aimed at adapting external form to function. Its purpose was to provide maximum operating efficiency in restricted areas through the elimination of all unnecessary protrusions and to increase strength through the substitution of welding for the rivets and bolts formerly used.

The trend to streamlining in the larger types of materials handling equipment was well exemplified in the heavy duty lift trucks and straddle carriers exhibited by The Ross Carrier Co., Benton Harbor, Mich., and in the smaller equipment by the Transitier light weight lift truck, manufactured by the Transitier Truck Co., of Portland, Ore.

Automatic Transportation Co., Chicago, displayed its latest industrial truck models, including the Transporter, the Skylift Brawny fork truck for handling loads of 4000 to 8000 lb, and the Skylift Giant, which is said to be the world's largest fork and ram truck, built in capacities up to 30 tons. ATCO also exhibited its new Skylift Shipper fork truck, which is designed for crowded, low-clearance operations. It is capable of

(*Turn to page* 82, *please*)

The Automobile Industry That's Behind the Iron Curtain

(*Continued from page* 27)

engines produced has been large, especially in relation to the modest volume of total production. Thus, no less than six models of 215 gas-producers have been manufactured since 1936. Two reasons exist for this situation: switches of prototypes and manufacture of sub-standard series. On one hand, the medium passenger car engine has changed from a copy of the Ford A and B to a modification of the Continental F 4140; the heavy passenger car, from a copy of the Buick 33-90 and 36-90 to one of the Packard Custom Super 8-1808. On the other hand, production of sub-standard series, many being manufactured in job-lots in local shops, has been a characteristic of the Soviet automobile industry, most strongly developed during World War II. Such series include the G59 U-01 and 01A, G71, G69-01 and 01A, and G70 gas-producer vehicles, and the ZIS-5V and ZIS-50 trucks (the former, a wartime substitute with a wooden cab and some wooden structural members; the latter, a transitional model with the ZIS-120 engine and ZIS-5 chassis). The net effect of this large number of non-interchangeable models, aggravated by the influx of Lend Lease vehicles of many makes, has been to make the problems of maintenance and repair and replacement parts production for the motor-vehicles of the USSR exceedingly difficult.

Dependence on Foreign Prototypes

The overwhelming bulk of the engines, chassis and major components in production, or planned for production, in the USSR to date have been copies of foreign prototypes, as is shown in Table I. Ford, including Marmon-Herrington modifications and British Ford, Autocar, Buick, Packard, Brockway and Fiat have dominated Soviet design. In engine developments Hercules, Continental, and GM Diesel designs also have played vital roles. Designs of Brown-Lipe gearsets and Zenith, Marvel and Solex carburetors are used in many Soviet models. In addition, although detailed evidence by model is lacking, it is known that Timken-Detroit and Clark rear axles, Spicer universals, Electric Auto-Lite electrical equipment, Willard batteries, modifications of Purolator and Cuno Auto-Klean oil filters, SKF bearings and Ross steering gears have entered into the design of motor vehicles in the USSR.

In connection with Soviet dependence on foreign prototypes, it is important to note that the lag between initial foreign production and Soviet production of a design has actually *increased* between 1924 and the present time. Between 1924 and 1935 this lag averaged 3.0 years; between 1936 and 1941 it averaged 4.3 years; and between 1945 and 1948 (assuming that all the new models will actually be in production by that time), it will have increased to 9 years. Furthermore, the production of increasingly more obsolete models continues. In 1932, the average vehicle model in production was 3.0 years old. By 1938, the age of the average design in production (as measured from the date of initial foreign manufacture) had risen to 7.4 years; by 1940, to 8.3 years; and, by 1948—providing again that all the new models will be in production by that time—to 12.0 years.

This increasing lag is partly artificial, since the war years marked a period of "frozen" automobile design in the United States. Even correcting for this artificiality by throwing off some three years from the gap between foreign and Soviet adoption, and from the age of Soviet models for the period 1945-48 fails to disturb the basic trend. Two reasons exist for this increasing lag: one, Soviet anxiety to maintain production at all costs and consequent hesitancy to scrap obsolete but useable manufacturing equipment; the other, the increasing complexity and precision of modern motor vehicle design, which makes the task of unassisted copying ever slower and more difficult. The second factor appears to apply particularly to Soviet manufacture of GM Diesel engines.

Inefficiency of Production

High overhead, low production per worker, great waste and low quality characterize the motor-vehicle industry of the USSR. In 1937, one of the top production years, primary vehicle manufacturers employed 112,000 persons to produce 200,005 vehicles, or less than 1.8 vehicles per year per employe:

Plants	*Employes*
GAZ, ZIS, and YaAZ	87,000
Ufa Engine Plant and 6 component Plants	11,000
16 spare parts plants	14,000
	112,000

Of this total, between 55 and 58 per cent was overhead.

The productivity of repair plants and garages is even lower than that of primary plants. In 1936, average production in the repair plants was equivalent in value to less than half a vehicle per person per year, and even this average was held up only by the larger plants. The number of repairs per worker per year averaged three. In the decade that has elapsed, productivity has changed very little; in 1946, official standards set man-hour requirements for capital repairs at from 320 to 900, depending on the type of vehicle, equivalent to some four repairs per worker per year on the average.

Low production is aggravated by high waste and low quality. In February to June 1937, the percentage of rejects for connecting rods, camshafts and intake valves at the ZIS factory ranged from 11.4 to 23.8 per cent. In 1947, the Journal of the Automotive Industry of the USSR noted editorially that "rejects in castings in some cases are up to 20-25 per cent." Furthermore, the standards of performance of accepted items are often very low, especially in comparison with their prototypes. Thus the Soviet ZIS-101 engine had an output of 90 hp compared with the 113 hp of the original Buick 33-90, and the ZIS 110 has an output of 140 horsepower compared with the 160 hp of the original Packard. According to Soviet tests, the 3-STE-A-150 battery for the ZIS 110 (produced at the Podolsk Battery Factory), which is a copy of the Willard SK 5-133, proved to be inferior to its prototype and other foreign batteries. Soviet tires have been poor. Repeated records show a life of 600 to 1000 miles of tires; tests of the KIM-10 passenger car in 1940 gave an absolute range of 90 to 9000 miles for tire life. Nevertheless, important exceptions do exist. Thus it is evident from careful reports of controlled tests that the new GAZ-51 engine, equipped with cylinder inserts, has proven to be exceptionally resistant to wear even with poor gasoline.

Short Vehicle Life and High Operating Costs

According to Soviet theory, a graded system of repairs at prescribed intervals permits indefinite prolongation of vehicle life. For example, by 1938 standards, a GAZ M1 car operating in the Ukraine would undergo medium and capital repairs every 18,600 and 37,200 miles, respectively. In Central Asia, the repair intervals would be 0.8 as long.

Actually, however, repair intervals have been much shorter than officially scheduled; in 1937, vehicle life between capital repairs averaged 6000 to 12,000 miles, say 30 per cent of the average official interval. Furthermore, the small capacity and low productivity of the repair establishment has meant that many vehicles never are repaired.

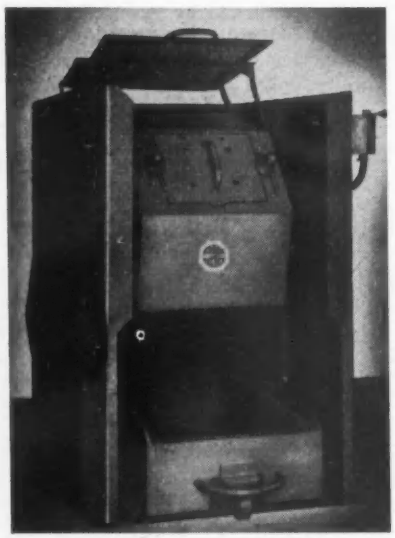
(*Turn to page* 58, *please*)

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 56

J-23—One Compartment Roto-Finish Machine

A one compartment Roto-Finish machine for small mechanized de-burring and finishing installations is announced by The Sturgis Products Co., Sturgis,



Sturgis Model CW-22-1 Roto-Finish machine.

Mich. Known as the CW-22-1 model, it has the same design and operational features of Sturgis CW-45-2 and CW-60-2 machines, that permit processing of small parts, using the Roto-Finish grinding, de-burring, Britehoning or coloring process.

The one compartment cylinder—19 in. by 32 in. ID—is lined with replaceable kiln dried hardwood maple and equiped with a full size, light weight door, with newly designed molded rubber gasket, held in place by fast-action cam locks. The guard is designed to raise and lower with minimum effort.

Standard equipment includes a forward and reversing switch with synchronized magnetic brake to facilitate loading and unloading; water attachment for adding water to the processing compartment; a 1½ hp 220-440-volt, 60 cycle, 3-phase motor with gear reducer; and a swivel type, 3-point suspension hoist pan for loading and unloading the processing media.

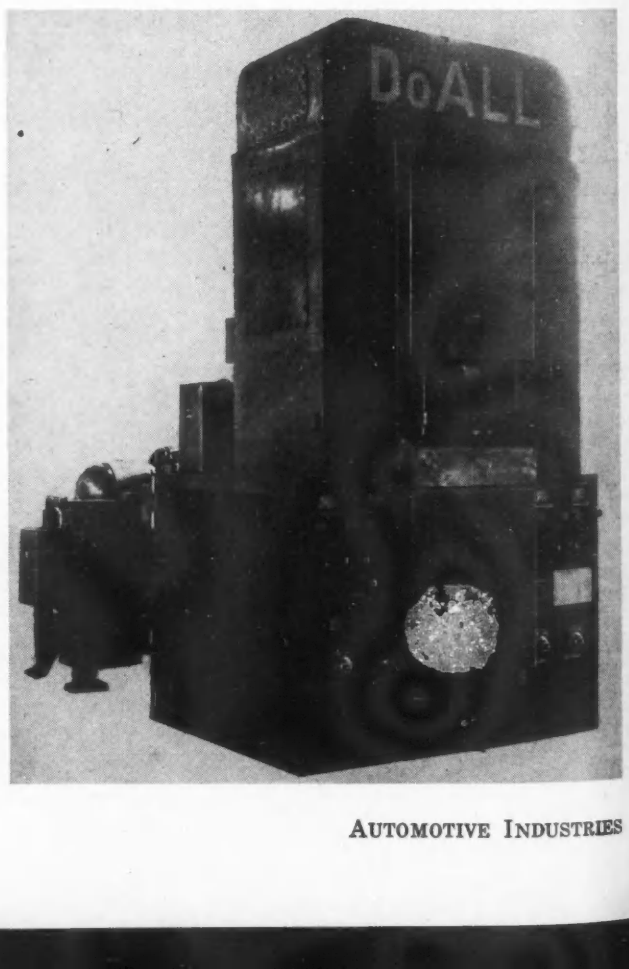
J-24—Presses for Metal Powder Process

The DoALL Co., Des Plaines, Ill., makes available several new presses to industries engaged in making parts by the metal powder process.

The 30-60 ton press is unusual in that the pressures are applied from the top and bottom as well as side pressures simultaneously through hydraulic cylinders. Variations in pressure on each cylinder are also obtainable by adjustment valves operating from a conveniently located control panel. Each top and bottom center cylinder and each pair of top and bottom outside cylinders and the two side cylinders operate by separately driven Vickers, 14 gal, 2000 psi pumps driven by individual 20-hp motors at 1200 rpm. This cylinder setup and ram action makes the press adaptable to a wide variety of shapes either cored or solid. The advantage claimed for this type of hydraulic drive is that each set of cylinders can be individually adjusted for rate of travel on both the power stroke and the return stroke. They can also be regulated for pressure.

The rate of travel on the power stroke is adjustable from 0 to 100 ipm and the return stroke from 2 to 200 ipm. Regulation for both speed and pressure is handled from the control panel. The press is equipped with positive mechanical stops for dimensional control. Relief valves are provided for density control. The feed mechanism is an air injection type which is said to assure uniformity of quantity in the die cavity. The press is fully automatic for high production runs. It is also equipped with jogging buttons on each motor for setting up dies. The production rates on this press are dependent on the size part being produced. However, parts can be made up to 150 per minute.

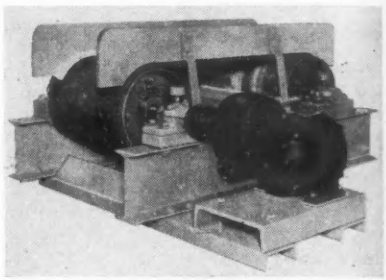
Also available is a 100-ton powder metal press. This press has a single acting top cylinder and two single acting bottom cylinders. The two bottom cylinders are coupled together to act as one and are so spaced as to permit the use of a stationary core rod. The hydraulic cylinders in this press are actuated by an 18-gpm Vickers pump at 2000 psi. The pump is driven by a 20-hp motor.



DoALL metal powder press.

J-25—Magnetic Separators

A complete line of self-contained horizontal and inclined magnetic pulley type separators, each incorporating an Alnico magnetic Perma-Pulley, idler



Dings separator.

pulley, endless belt and drive, has been placed on the market by Dings Magnetic Separator Co., 4740 W. McGeogh Ave., Milwaukee 14. Wis.

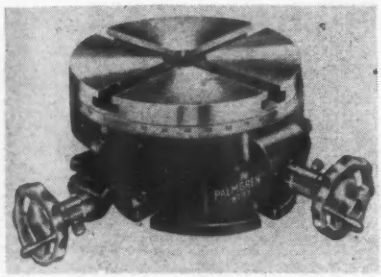
These units are designed to provide completely automatic removal of tramp

iron from such materials as coal, plastics, ore, chemicals, rock, rubber, slag, cement, sand, clay, etc., where either protection of machinery or purification of product is desired. They are intended for installation at the discharge of chutes, hoppers and conveyor belts or they can be fed by hand or by various material handling devices.

Standard models are available with belts of any desired length in widths ranging from 12 to 60 in. Perma-Pulley diameters range from 12 to 30 in. standard.

J-26—Indexing and Cross Slide Table

A new indexing and cross slide table, with a graduated rotary top, has been added to the line of the Chicago Tool and Engineering Co., 8383 S. Chicago



Palmgren No. 82 indexing and cross slide table.

Ave., Chicago 17, Ill. Known as the Palmgren No. 82, it is equipped with a table top graduated for the full 360 deg which can be rotated manually or locked securely in any desired position. The table is eight in. in diameter, and "T" slots are provided for mounting of parts and fixtures. The cross travel is accomplished by feed screws and calibrated in thousandths. Adjustable gibs are provided for take-up due to wear. A maximum travel of 4 in., plus the 360 deg rotation of the eight in. table top, make this tool adaptable to many operations. The base has four bolt and key slots for mounting to the table of the milling machine, drill press, shaper, or surface grinder.

J-27—Versatile Lift Truck

Silent Hoist & Crane Co., Brooklyn 20, N. Y., is manufacturing a unit designed for all types of load-handling work—hook, fork and ram—with each function specifically engineered as an integrated part of the complete machine. Named Lift-O-Krane, it is said to handle loads of any shape or size up to its maximum capacity. Two sizes are available; the Model FCK5 with a capacity of 5 tons at 24 in. from heel of fork, and Model FCK7½ which handles 7½ tons at 24 in. from heel of fork. Four speeds forward and four speeds reverse provide from two to 18 mph. The four-cyl engine develops approximately 50 hp at 2000 rpm. Standard equipment includes electric starting and lighting, oil bath air cleaner, oil filter, 20 gal fuel tank, and one full-floating seat.

Lift-O-Krane made by Silent Hoist & Crane Co.

J-28—High Speed Precision Lathe

A new high speed precision lathe with variable speed drive and free spindle clutch is offered by Hardinge Brothers, Inc., Elmira, N. Y.

The hardened and precision ground steel bed ways are a new improved dovetail design. The dovetail ways form a solid bed top. The dovetail design bed way protects the accurate angular ways from falling chips and foreign matter. The lathe bed has a three-point mounting on the welded steel pedestal base. The three-point mounting insures original bed accuracy even when the machine is placed on an uneven floor.

The ball thrust tailstock spindle has a constant full bearing in the tailstock body regardless of the position of the tailstock spindle. The tailstock body has a mating dovetail section to securely anchor the tailstock to the hardened and precision ground steel dovetail ways.

The variable speed drive provides infinitely variable spindle speeds from 90 to 3500 rpm. The desired spindle speed is obtained by turning the large

Hardinge precision lathe.

diameter handwheel. The handwheel screw actuates the variable speed mechanism, thus affording very fine and positive adjustment of spindle speed. The spindle speed is indicated on the large direct reading dial. The variable speed drive is so arranged that the spindle speed will not vary during operation of the machine, once the speed control wheel has been set. The variable speed drive is also arranged so that when the electric motor is shut off the handwheel is locked and cannot be turned. This prevents injury to the variable speed drive.

J-29—Heavy-Duty Nut Setter

A high-speed, heavy-duty, electric nut setter, the Speed-o-matic, has just been introduced by the Illinois Gage & Mfg. Corp., 4639 W. Washington Blvd., Chicago 44, Ill. This nut setter is torqueless—it will not twist in operator's hands when nut becomes tightened. It operates at high speed, driving nut or bolt 1750 rpm at free speed. At point of resistance, impact unit automatically

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delivers 3000 impact blows per minute.

The unit is instantly reversible for removing bolts or nuts. Equipped with 25 ft of rubber covered cord and plug

Speed-o-matic nut setter

with ground wire, it operates on any 110 volt, 60 cycle, a-c or d-c circuit. It has an overall length of 12½ in. and weighs 13½ lb. Its capacity is up to ¾ in. bolts and nuts.

J-30—Automatic Welding Equipment

Everything needed for automatic welding—welding head, control equipment, welding transformer and work positioning equipment—is available from Westinghouse Electric Corp., Pittsburgh, Pa., in a single package. The standard weldomatic head, suitable for welding with alternating or direct current, operates with a capacity of 1200 amp, a-c. Special nozzles are available for 2000 amp, a-c. Capacity for d-c welding is 800 amp. The head is so designed that it can be rotated 360 deg in the vertical or horizontal plane. As a result, it can be mounted in any position for welding. Nozzles and knurled drive wire feed rolls are supplied to accommodate ⅛, 5/32, 3/16, and ¼ in. wire diameter. Wire feed is automatic. The speed of the driving motor is controlled by the burn off rate of the welding wire through a bridge hook-up consisting of arc voltage, control generator field in a potentiometer.

The motor-generator set is driven by a 2-hp, 220/440 volt, 3 phase, 60 cycle a-c motor. A 2-pole constant-potential generator supplies the control current and a 2-pole variable-voltage generator supplies current to the driving motor in the head. Control relays and contactors required in the operating circuit are mounted in the control panel. Control equipment for starting and stopping the welding arc and traverse mechanism, as well as adjustment for arc length, is mounted on the operator's panel.

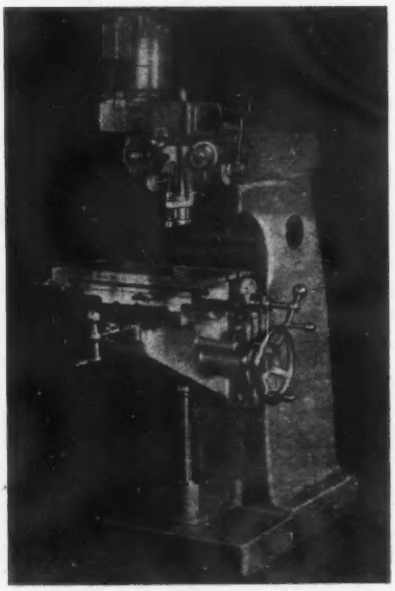
The work positioning equipment is supplied as needed for the job from semi-standard designs of: Travel carriages; mounting pedestal; rotator; positioner; and turning rolls.

J-31—Vertical Milling Machine

The George Gorton Machine Co., 1131 W. 13th St., Racine, Wis., is building a ram type, hand feed vertical milling machine, the O-16A, which is available with either swivel head or universal head. An adjustable ram, heavy column, sensitive table and saddle movements, and quickly adjustable swivelling or universal head with super-speed spindle make this machine suitable for the toolroom, die-mold shop and for production milling on small parts.

This machine can also be supplied especially equipped for general engraving and brass routing, also for die and mold duplicating.

Included on this model are features such as: Positive spindle brake for instantaneously stopping spindle and locking it in place when changing cutters; spindle lock for holding spindle at desired position for setting-up and milling operations; screw-type spindle depth stop graduated in thousandths that provides positive and accurate setting of cutter depth; and a simple, quick action, position belt tension adjustment.



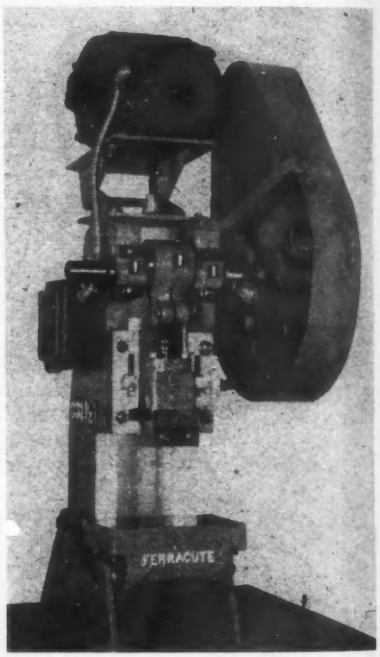
Gorton milling machine

The head on the adjustable ram on this machine is furnished with either a single swivel graduated 45 deg left and 90 deg right or universal head providing same adjustment as above, but with an additional 45 deg front and back movement at right angle to table.

A ½ hp, high torque, reversible motor provides six spindle speeds from 300 to 5000 rpm. Speeds from 600 to 10,000 rpm available at additional cost.

J-32—Inclinable Punch Press

Ferracute Machine Co., Bridgeton, N. J., has brought out a six-ton inclinable punch press, the Model C-31½. Features are: bronze-bushed journals,



Ferracute model C-31½ punch press

crank pin, long ram surface and ground gib surface. A pin clutch is employed.

Bed area of the C-31½ is seven by 11 in., depth of throat is 3¾ in., and die space 6½ in. The standard stroke of ram is 1¼ in. with a maximum of two in. Area of face of ram is 4⅛ in. by 3¾ in.

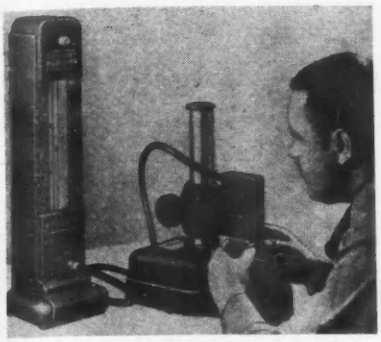
J-33—Impact Wrench

Keller Tool Co., Grand Haven, Mich., is manufacturing a new air-operated impact wrench, the size No. 18-6. This addition to the Keller line has a nominal capacity of ⅝-in. bolts. Design is similar to the Keller ⅜ in. capacity impact wrench, No. 18-4. The same direct impacting mechanism is used. There are no springs, gears, or clutches.

An air motor of the rotary type furnishes the speed and power for fast nut running.

K-25—Method of Checking Gage Blocks

A new and unique method of accurately checking the length of precision gage blocks by air has been developed by the Sheffield Corp., Dayton, Ohio. There is no gage point contact—the only pressure exerted on the work is that of a stream of air flowing against the upper and lower surfaces.



Precisionaire device for checking gage blocks.

It is not necessary to wring the gage block to the anvil, with possible resulting minute wear, and no distortions are set up in placing the block in gaging position.

The comparator consists of a gaging unit and a Precisionaire base instrument with an amplification up to 40,000 to 1. Each minor graduation of the scale represents one millionth of an inch. The gaging unit has one jet in the diagonally serrated anvil and another in the gaging head which is mounted on the bracket, adjustable vertically on the column. The air supply to both jets comes from one hose connected to the base instrument.

The gage blocks are checked against a master calibrated set of blocks which are used in setting up the comparator and obtaining a zero reading. The gage block to be checked is then placed on the anvil between the two air gaging jets. Any change of the float from zero indicates the deviation from the master, and the amount is read directly from the graduated scale.

K-26—Super-Balloon Tire

A new tire made by Firestone Tire and Rubber Co., Akron, Ohio, will be introduced as standard equipment on 1948 models of some of the major automobile manufacturers. This new Firestone tire, known as the Super-Balloon, features a new tread and shoulder design.

A softer ride is said to be assured by the new tire because it contains more air at a lower pressure. The Super-Balloon tire also has a larger footprint on the road. Scientifically engineered skid-resistors are being introduced in this 1948 tire to increase forward and lateral traction.

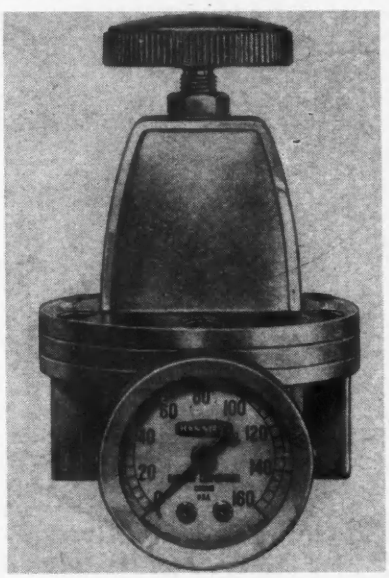
All sizes of the Super-Balloon tire on new cars have a 15-in. rim diameter. This advantage has enabled some manufacturers to lower the center of gravity of their new automobiles.

Motorists now using conventional tires will be able to change over to Super-Balloon tires to obtain the comfort of new car riding qualities in their older model automobiles. Special sizes of the low pressure Super-Balloon have been developed by Firestone to meet the change-over demand of car owners who prefer the new tires.

A comparison of the conventional 6.00-16 tire with the new Super-Balloon, which will be marked 6.70-15 to conform to the smaller rim diameter and the wider cross section, shows the Super-Balloon air cushion volume to be 115 cu in. greater. And this increased volume is carried at a pressure of 24 lb instead of 28 lb.

K-27—Two New Hannifin Products

A new, improved automatic pressure regulating valve designed specifically for service on compressed air supply lines is offered by Hannifin Corp., 1101 S. Kilbourn Ave., Chicago 24, Ill.



Hannifin pressure regulating valve.

Named the "Air Warden," the regulator is for use on initial, or primary, air pressures up to 150 psi and can be set to maintain reduced, or secondary, pressures ranging from 125 down to five psi. The new development embodies a number of construction and operating features heretofore unavailable in a small size, moderately priced valve, according to the manufacturer.

Through the use of a "free-floating" valve stem, it is possible to back-off, or reduce, the delivered pressure under dead end conditions by turning the adjusting screw. This has application on air cylinder installations where it may be desirable to reduce the applied pressure without exhausting the cylinder. Pressure reduction through use of the regulator adjusting screw provides high precision control. This same design feature also insures positive protection against pressure build-up under

NEW ★ PRODUCTS

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dead end conditions and contributes a stabilizing effect which is particularly desirable in handling sudden pressure changes such as may be occasioned by air operated equipment. The new Hannifin regulator is being produced in two models. Model RD-1 is for ⅜ in. line piping and Model RD-2 is for ½ in. connections.

Another new Hannifin development is an electrically-operated, four-way valve for directional control of the flow of compressed air. Designed primarily to provide a fast-acting push button control for small, air operated presses and similar units, the valve also has application as an automatic control for any air operated unit through the use of limit switches or mechanical stops.

The valve itself is a newly developed packless reciprocating disk type, pilot operated and solenoid controlled. The piston is aluminum and the disk is hardened stainless steel. It is built in two types. Type I is arranged for double solenoid operation using two push buttons or limit switches. Valve position is determined by energizing the proper solenoid. Type II is arranged for power offset operation using a single push button or limit switch. The valve returns to its initial position when the solenoid is de-energized.

Hannifin four-way valve.

Either type is capable of as many as 180, or more, operating cycles per minute in handling any air pressure from a minimum of 25 psi to a maximum of 150 psi.

Electrical power consumption is small; Type I units are rated at 10

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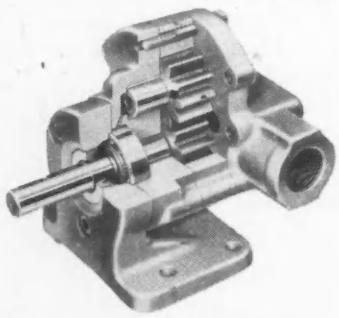
watts, Type II units at 20 watts. Standard models are built for 115 volt, 50-60 cycle circuits, but can also be supplied for 230 volt, 50-60 cycle power, or for d-c, low voltage a-c, and for other frequencies.

The valve is offered in three models. Model NE-37 is tapped for ⅜ in. diam inlet and cylinder and ½ in. exhaust pipe connections. Model NE-50 has ½ in. inlet and cylinder and ¾ in. exhaust. Model NE-75 has ¾ in. inlet and cylinder and 1 in. exhaust.

K-28—Gear Type Hydraulic Oil Pump

Adel Precision Products Corp., Burbank, Calif., is now in production on a new gear-type, hydraulic oil pump for industrial machinery applications. Designed for 1000 psi service, these new pumps are available in various models with rated capacities at 1800 rpm, from 1.5 to 60 gpm. Each model is available in a choice of mountings—foot, flange, etc.

Precision-machined, spur-type gears are employed. The cut-away view of



Cut-away view of Adel pump.

the pump illustrates the special seal used on the drive shaft. A ball bearing on the drive shaft absorbs all thrust and radial loads imposed by the drive. Alloy iron housings are used throughout, with hardened steel gears and shafts.

One of the features of the new Adel pump design is the method of keying the gears to the shafts. A unique ball drive permits gears to float endwise on shafts. This prevents any thrust loads from being transferred from the shaft to the gears or end plates. It also insures alignment of the gears at all times.

Another feature is the unusual method of lubricating the internal working parts of the pump. Fluid trapped in the pumping gears it utilized to pressure-lubricate shafts, bushings and bearings.

K-29—Flow Control Valve

A unique new flow control valve for air or hydraulic cylinder speed control which provides accurate control of cylinder speed plus unrestricted flow from the cylinder, has recently been introduced by Pneu-Trol Devices, Inc., of 3122 N. California Ave., Chicago, 18, Ill.

The new flow control valve, it is claimed, assures greater efficiency and full use of air or hydraulic cylinder

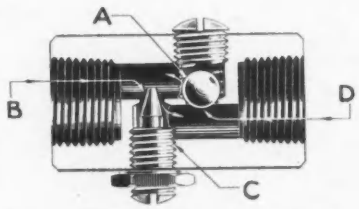


Diagram of Pneu-Trol valve. A—Floating ball check. B—Controlled flow to cylinder. C—Control valve. D—Free flow from cylinder.

power because it eliminates abnormal pressure of the exhaust from the return side of the cylinder, increasing the cylinder effective power pressure.

When the flow is to the cylinder, in either direction, the ball check instantly closes and the flow path is directed through the flow control valve, which has a wide range of adjustment. The reverse flow from the cylinder is unrestricted because the unloaded ball check opens wide on a slight change in pressure.

The flow control valve is made in ¼, ⅜ and ½ in. pipe sizes from brass hexagon roll bar stock. All other parts are stainless steel.

K-30—New Type Rubber

A new type American rubber that can be compounded and vulcanized in a wide range of soft to hard compositions is announced by B. F. Goodrich Chemical Co., Cleveland, Ohio. The new product, to be known as "Hycar P.A.," is identified as a polyacrylic ester and is an elastomeric material resembling natural, pale crepe rubber in appearance. The vulcanized forms are said to exhibit outstanding resistance to heat, oils, ultraviolet light, ozone and gas diffusion. Non-rigid compounds show extremely good flexing life. Compounding, molding, extruding, calendering and curing operations are readily accomplished with standard rubber processing equipment.

Available in both dry and latex forms, Hycar P.A. in the unvulcanized state is expected to find many applications as an adhesive and as a coating or impregnant for fabrics and papers. Vulcanized products have shown outstanding performance as heat-resistant coatings on fabrics, heat and oil-resistant gaskets, hose, belting, oil seals and other mechanical applications, according to the manufacturer. As an insulation coating on electric motor coils, and as a heat and oil-resistant jacket for wire, polyacrylic ester shows promise of extending the usefulness of electrical products.

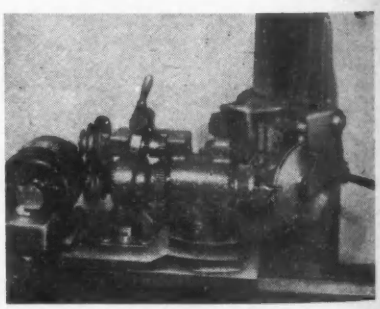
K-31—Coating for Spray Booth Walls

A new coating compound for use on the walls of paint spray booths has just been brought out by Detrex Corp., Box 501, Detroit 32, Mich. This new compound can be used for facilitating maintenance on both wet and dry spray booths, but has characteristics that are said to make it especially advantageous for use on the walls of dry booths.

Triad PRD is a light-colored, semi-liquid material that is applied to the booth walls with a brush or spray gun. For spraying, a 20 per cent dilution (four parts of Triad PRD to one part water) produces a viscosity that can be handled in a pressure tank. This material can be brushed on as it comes, although a 10 per cent dilution with water usually provides a better consistency. The coating of Triad PRD dries and forms a continuous white coating to which paint overspray adheres.

K-32—Relief Grinding Attachment

The circularity grinding attachment for grinding form relief, radial relief or both at once, is a recent development of Detroit Reamer and Tool Co., 2830 E. Seven Mile Rd., Detroit 12, Mich. This attachment is made to fit on any conventional cylindrical or cutter



Grinding attachment made by Detroit Reamer and Tool Co.

grinder and when not being used for grinding cutting tool relief, it serves as a conventional motor-driven headstock.

As the spindle of the attachment revolves, a cam generates the relief in the tool. The same cam is used for all tools. The amount of relief is changed by scale adjustment.

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Improvement in service and appearance of many parts without increasing their weight is possible with J&L Electricweld Tubing. It is made of J&L Controlled Quality Steel—has the strength and surface finish that fits readily into plans for new and advanced machines and equipment. It can be readily cut, welded, bent, upset, swaged, or formed—is used successfully in many manufacturing and assembly operations. Write for information today.

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K-33—Automatic Focus Rectifier

An automatic focus rectifier for mosaic map making has been designed and built by the Bausch & Lomb Optical Co., Rochester 2, N. Y.

Resembling an ordinary photo enlarger, it simultaneously enlarges, prints and automatically reduces aerial photographs to a common scale and level, correcting the tilt encountered as a result of the plane's variation in angle and level at the time photographs are taken.

Bausch & Lomb focus rectifier

Equipped with push button controls, the automatic instrument can be operated by a photographer, turning out rectified prints on a production line basis at the rate of one every five minutes, according to the manufacturer.

Designed around the requirements of the Army Corps of Engineers, the rectifier will be available for commercial use before the end of the year. Small enough to be mounted on a trailer truck for use in field work, it has fluorescent illumination, an enlarging lens of high optical resolution, and is constructed to maintain constantly the proper alignment between the negative and printing easel.

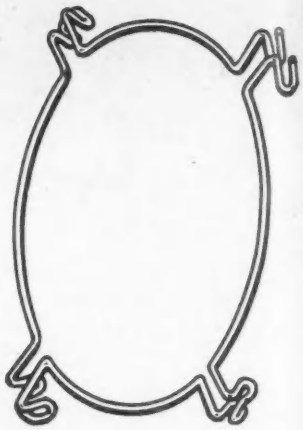
Three push-buttons control tilt, magnification and swing. The first operates a device which compensates for the tilt of the plane, and can accommodate tilts as high as 20 deg.

A second button regulates magnification, automatically bringing photos taken at varying elevations to desired map scale. The remaining button controls swing, re-establishing in the instrument the plane's angle of deviation from its true course.

K-34—Hose Mounting Clip

The Glenn L. Martin Co. has developed a hose mounting clip which, with spring tension, will hold tubing firmly and completely clear of an aperture through which it passes and prevent the result of persistent, though possibly slight, contact between an air duct and the edges of a hole in a metal bulkhead.

The clip used to support a hose or duct of 2 1/16 in. outside diameter is made from one continuous piece of cold drawn music wire about 13 3/16 in. long. It is shaped roughly into a circle and at four points the circle is interrupted as the wire is made to form grippers. The circle holds the duct firmly and the grippers fit tightly against the edges of the aperture. Thus the duct is suspended in the center of the aperture without touching the edges and, because the clip grasps the duct tightly, friction between the clip itself and the duct is eliminated.



Martin hose mounting clip

Manufacturing and sales privileges have been granted by the Glenn L. Martin Co. to the Pepka Spring Co., 810 S. Waugh St., Kokomo, Ind.

K-35—All-Weather Helicopter Blades

All-weather helicopter blades of stainless steel construction built by Goodyear Aircraft Corp. of Akron, Ohio, are undergoing service tests at the U. S. Air Force Propeller Laboratory at Wright Field.

Flight tests of these blades installed on an R-5 Sikorsky helicopter are said to indicate that the stainless-steel rotary wings have lifting characteristics superior to conventional blades and may be flown safely in light or heavy rains. One of the features of the Goodyear Aircraft development is the leading edge de-icing system incorporated into its basic construction.

A flexible tube at the rotor head carries hot air to the root of the blade and along the leading edge. It is anticipated this design will eliminate the formation of clear and rime ice while aircraft is being operated in icing conditions.

Leading edge assembly of the new rotary airfoil is .030-in. stretched stainless steel with no seams or splices. Sup-

(*Turn to page 72, please*)

Current Automotive Patents Issued

Water Injection System for Internal Combustion Engine. Paul F. Adair, Dayton, Ohio. (2,431,679).

Variable Capacity Fuel Pump. Desire J. Deschamps, Rutherford, N. J., assignor to Deschamps Fuel Injection Corp., New York, N. Y. (2,431,686).

Hydraulic Shock Absorber. Charles Raymond Waseige, Rueil, France; vested in the Attorney General of the U. S. (2,431,716).

Deicing and Heating Device for Rear Drive Motor Vehicles. Harry H. Schneider, Bronx, N. Y. (2,431,773).

Outboard Motor. Romuald Karey, Baltimore, Md., assignor to Bendix Aviation Corp., Brooklyn, N. Y. (2,431,806).

Engine Speed Governor. Marion Mallory, Detroit, Mich. (2,431,816).

Non-Knocking Method of Operating Internal Combustion Engines. William N. Feeney, New York, N. Y., assignor to the Texas Co., New York, N. Y. (2,431,857).

Two-Cycle Engine, Crankcase Compression, Valve Piston. Reginald John Fisher, Leamington Spa, England. (2,431,859).

Fuel Injector. Raymond W. Larson, Gary, Ind., and Carl J. Stalvey, Jacksonville, Fla. (2,431,874).

Method of Operating Internal-Combustion Engines. Kenneth Donald Mackenzie, Oceanside, N. Y., assignor to The Texas Co., New York, N. Y. (2,431,875).

Vacuum Car Heater. Dick E. Catlin, Kutch, Colo. (2,431,918).

Carburetor. Leo E. Oliver, Sanger, & Ray Carson, Sr., Vallejo, Calif. (2,431,958).

Hydraulic Shock Absorber. Edwin F. Rossman, Dayton, Ohio, assignor to General Motors Corp., Detroit, Mich. (2,431,966).

Trailer and Swingable Axle Construction Therefore. Warner L. Keehn, Spokane, Wash. (2,431,018).

Turbine Type Hydraulic Torque Converter. Stanley Mayner, Cleveland, Ohio, assignor of one-fourth to Thomas S. Mayner, Willoughby Township, Lake County, Ohio. (2,432,115).

Engine Governor. Marion Mallory, Detroit, Mich. (2,432,166).

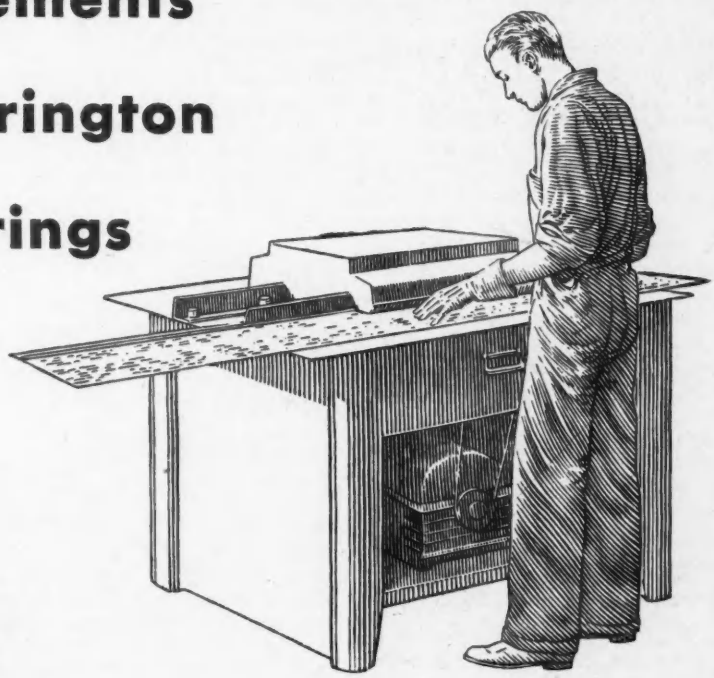
Diesel Engine Testing Apparatus. John D. Morgan, South Orange, and Percy B. Levitt, Millburn, N. J., assignors to Cities Service Oil Co., N. Y., N. Y. (2,432,168).

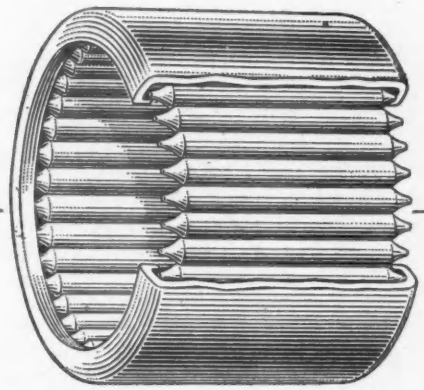
Fluid Coupling Automatic Control Valve. Roland Chilton, Ridgewood, N. J., assignor to Wright Aeronautical Corp. (2,432,191).

Carburetor for Internal Combustion Engine. John M. Barr, Meriden, Conn., assignor to Niles-Bement-Pond Co., West Hartford, Conn. (2,432,274).

In one pass, Lockformer sheet metal machines form flanges ordinarily requiring many brake operations. Needle Bearings on gear trains and forming rolls greatly reduce power requirements and increase service life.

Power Requirements Cut 50% by Torrington Needle Bearings





... another advantage of these compact anti-friction units is capacity to carry high radial loads imposed on forming rolls of the Lockformer.

BY CHANGING to Torrington Needle Bearings on gear trains and forming rolls, the Lockformer Company cut the power consumption 50% in all models. *No major design changes were required* in adapting these compact anti-friction units to the limited space available. Simple housing design and easy installation by one arbor press operation keep fabrication and assembly costs low.

Ten years of successful operation in thousands of Lockformer machines attest the long service life assured by the high radial capacity, smooth operation and efficient lubrication of Needle Bearings.

These are only a few of the many advantages you can realize in equipment you design, build, sell or operate by insisting on Torrington Needle Bearings.

You will find the engineering skill and experience of Torrington's engineers helpful in adapting these efficient anti-friction bearings to your requirements. Call or write the nearest Torrington office or direct to ...

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LOOSE ROLLERS

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

H-24—Carburizing and Gas Cyaniding

Leeds & Northrup Co.—A new 25-page illustrated catalog, Homocarb Method for Carburizing and Gas Cyaniding, contains installation photographs of Homocarb furnaces; describes and illustrates the improved Homocarb control panel complete with Micromax Electric control, time clock, accessories and its related cabinet. Included also are a diagramatic view showing the built-in natural-convection cooler. A chart shows uniformity obtained when temperature, quality of gas, amount of gas and time are under precise control.

H-25—Wheel Dressers

Carboloy Co., Inc.—An illustrated 18-page booklet, No. DR-480, describes the company's line of diamond impregnated cemented carbide grinding wheel dressers.

H-26—Nylon Rod and Strip

The Polymer Corp.—A new folder containing data on the physical properties, fabrication and recommended uses of nylon rod and strip is available. A table giving physical properties and test results, moisture absorption charts, and a brief description of Nylatint, a new process for coloring molded nylon, are included.

H-27—Axiflo Fans

Westinghouse Electric Corp.—An 8-page color booklet describes the new line of Westinghouse Axiflo Fans. The booklet contains pictures of the various models available in either the elbow or straight-through type and describes how the cone arrangement and other features, including low maintenance and ease of installation, make these positive pressure fans suitable for such applications as air conditioning systems, heating and ventilating, dust and fume removal, equipment and machinery cooling, heat treating nonferrous metals and industrial drying and processing. Characteristics and special advantages of each type of fan are listed.

H-28—Standardized Hydraulic Presses

Hannifin Corp.—A new, 20-page bulletin describes the company's line of Standardized Hydraulic Presses. Detailed specifications and dimensions together with information and recommendations on the selection of presses are contained in the bulletin.

H-29—Cutter Grinders

The Ingersoll Milling Machine Co.—The Cutter Grinder Catalog No. 57 is written as an operator's instruction manual and as a repair and maintenance guide. It describes through illustrations the wide application of the grinder and explains in detail the procedure for sharpening milling cutters with carbide, cast alloy, or high speed steel blades. Listed also are recommendations for grinds for various types of face mills on different types of material.

H-30—Solders

American Smelting & Refining Co., Federated Metals Div.—An illustrated, two-color leaflet describes basic and special solder types produced by the company, and gives application data. Also discussed are acid core, rosin core, solid wire and body solders.

H-31—Bronze Electrodes

Ampco Metal, Inc.—Welding with Ampco Bronze Electrodes is the title of Bulletin W-17. It contains factual information on how to weld a wide variety of alloys using bronze arc welding electrodes. Detailed information on welding procedures and techniques is given, as well as a comprehensive chart listing alloy types, specifications, chemical compositions, physical proper-

(*Turn to page* 68, *please*)

TIME SAVER COUPON for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR new Production and Plant Equipment OR New Products items described on following pages.

Automotive Industries,
Chestnut & 56th Sts., Philadelphia 39, Pa.

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Your Name ..... Your Title .....

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USER REPORT:

"Our average brake maintenance cost .....$0.00085 per mile."

DAILY FREIGHT SERVICE

SCHMIDT TRUCK LINES

FARGO
Dial 6232

Duluth 2, Minnesota
July 10, 1947

Warner Electric Brake Mfg. Company
Post Office
Beloit, Wisconsin

Gentlemen:

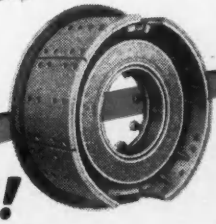
During the past twelve months we have kept maintenance cost records on all our trailers. Brake maintenance, including parts and labor, averaged $51.00 per unit and each unit travelled more than 60,000 miles. Our average brake maintenance cost was $0.00085 per mile.

We are satisfied that no other type of power brake could have given us the low maintenance cost of your electric brakes. However, we would like to know if our costs are comparable with other fleets using Warner Electric Brakes.

Your brakes have been used exclusively on all our equipment since 1932.

Very truly yours,

SCHMIDT TRUCK LINES
By Adolph Muehring



NEW!

Warner Electric Brakes of 2-shoe construction in sizes 16½" x 5", 16½" x 6" and 16½" x 7". A really new concept of super-stopping power. Ask about them.

WARNER ELECTRIC BRAKES
USED EXCLUSIVELY BY US SINCE 1932!

THE low-cost maintenance and long-time satisfaction experienced by SCHMIDT TRUCK LINES is *not unusual — it's just good average performance* for Warner Electric Brake equipped fleets!

Warner Electric Brakes are specifically engineered to meet every trailer braking need. No other brakes equal their rugged construction, long lining life, positive control and dependable performance even under the most severe conditions, of rain, snow and ice.

Being activated by electricity, they are instantaneous in action — a vital factor in emergencies.

CHECK YOUR BRAKE PERFORMANCE AND MAINTENANCE COSTS! If you want maximum safety plus economical performance, standardize on Warner Electric Brakes. Write for illustrated literature explaining their many advantages.

WARNER ELECTRIC BRAKE MFG. CO.
BELOIT, WISCONSIN

WARNER
THE ORIGINAL AND PROVEN
ELECTRIC BRAKES
SINCE 1927

The Automobile Industry That's Behind the Iron Curtain

(*Continued from page* 47)

In 1937, only 55-60 per cent of the vehicles in the USSR were actually in operable condition, the situation has not improved to date. Official repair intervals for the same models of vehicles average no greater in 1946 than in 1938; in fact, the addition of new, high-compression vehicles has reduced the overall average. Actual vehicle life is proportionately shorter. In 1946, the average life of Lend Lease vehicles between capital repairs was officially estimated at 6000 to 9000 miles, although tests on 100 Willys MB, 100 Ford 2G8T and 100 Dodge WF 32 trucks in 1944 showed that every one of the vehicles needed capital repairs at the end of 8000 miles. These repairs included cylinder grinding, replacement of the piston group, repouring of main bearings, re-welding of frames and other major undertakings in every case.

Repairs are not only frequent but also expensive. In the period 1936-39, capital repair costs averaged 3000 rubles; between 20 and 50 per cent of the assessed value of a vehicle was spent annually on repairs. For 1947, the Central Scientific Research Institute of Automotive Transportation has estimated that for an average pool of 50 trucks, total repair and maintenance requirements will total 200-man-days per truck per year. With an average run of 18,000 miles, annual costs for a GAZ-AA will average 8000 rubles, including 5000 rubles for spare parts, while comparable costs for a ZIS-5 truck will be 11,500 rubles, including 7000 rubles for spare parts. Even minor parts and repairs are staggeringly expensive. A 34x7 tire cost 324 rubles in 1946; a single, small tire patch, 20 rubles. (The average pay of an industrial worker in the USSR is some 250 rubles per month.)

The short life of vehicles in the USSR stems from the inferior quality of gasoline and lubricants, harsh climatic conditions, miserable roads, poor materials and poor workmanship in the vehicles, inadequate maintenance and repair facilities, and haphazard servicing routines. High repair costs derive primarily from the perennial shortage of spare parts. Even in 1938—the best production year in the history of the Soviet motor-vehicle industry—only 16 to 40 per cent of the planned levels of spare parts production were achieved. Consequently, except for the plants of the Glavsoyuzremont repair network which received preferential treatment, no repair shops in the USSR received over a quarter of the necessary spare parts. They therefore continued their practise of local production of such parts, an extremely slow, expensive and inefficient process. Accelerated wear during the war, the influx of Lend Lease vehicles and advancing standards of Soviet design have aggravated the situation, since the local shops are scarcely able to produce parts of the high metallurgical quality and close tolerances required.

A number of measures have been instituted, however, to lengthen vehicle life and reduce repair costs, at least for newly-produced Soviet vehicles. The new models have been equipped with exhaust-valve and cylinder inserts; removable main bearings; fuel, air and oil filters, and winter pre-heating devices. Parts subjected to extreme wear are induction hardened. Some progress has been realized in improving fuel and lubricants. Attention is being focused on civilian adoption of a preventive maintenance routine comparable to that of the Soviet Army. Finally, plans have been made—although not realized to date—to provide a flow of semi-machined replacement parts in graded sizes according to the degree of wear for pistons and other parts. Consequently, some improvement in regard to vehicle life and operation costs in the USSR may be expected.

Inferior Gasoline and Lubricants

Complaints in Soviet literature about the poor quality of gasoline and lubricants in the USSR became numerous by the late 1930's, but little attention was paid to these factors as limits to the sound development of motor vehicles. The disastrous effects of Soviet gasoline and lubricants on Lend Lease trucks, however, made a deep impression. Krzhivitskii and his associates, who were engaged in research on Lend Lease vehicles, discovered that Soviet gasoline ("Cracked Benzine No. 2") not only failed to meet American standards but was also consistently inferior to minimum Soviet specifications, particularly in regard to volatility and octane rating. (See Table II.) Consequently, they induced the Soviet of Peoples' Commissars of the USSR to issue a decree on 10 August 1943 requiring that Lend Lease vehicles (and comparable Soviet military vehicles, such as GAZ 61, 64 and 67) be provided with gasoline with a maximum terminal point of evaporation of 428 F. As a temporary palliative measure, there would be permitted use of mixtures of 70-80 per cent Cracked Benzine No. 2 and 20-30 per cent Aviation Gasoline B-70, or of Cracked Benzine No. 2 plus Ethyl Lead V-20 with pre-heating of the engine. The execution of these measures, as well as the provision of stable, acid-free lubricating oils, high-pressure greases, and hydraulic brake and shock-absorber fluids, which were completely lacking in the Soviet Union, were made possible by Lend Lease.

Sharply increased military requirements and loss of petroleum facilities through enemy action virtually eliminated gasoline and even Soviet lubricating oils from the civilian economy. A large proportion of the civilian vehicles was converted to gas-producers burning firewood, lignite or low-quality peat. Substitute lubricants included even the large-scale use of turpentine. It is remarkable that Soviet vehicles continued operation, however inefficiently, under such circumstances.

Since the war, new specifications for gasolines have been promulgated. The new standard gasoline (GOST 2084-46) represents no substantial improvement; permissible gum content has, in fact, been increased. The winter gasoline (GOST 3254-46 is better, and approximates U. S. minimum specifications for Type C (low cost) gasoline, except that its octane rating is higher. It is therefore completely inadequate for the winter operation of modern, high-speed, high-compression engines. Neither the standard nor the winter gasoline approach the minimum recommendations of the Krzhivitskii report. (See Table II)

In addition to the two basic gasolines, specifications have been developed for, and limited production instituted of, a special gasoline for the ZIS-110, a Soviet copy of the Packard. This special gasoline and Soviet Aviation Gasolines B70 and KB70 are the only fuels presently available in the USSR which conform to or exceed minimum standards for modern automobile fuels.

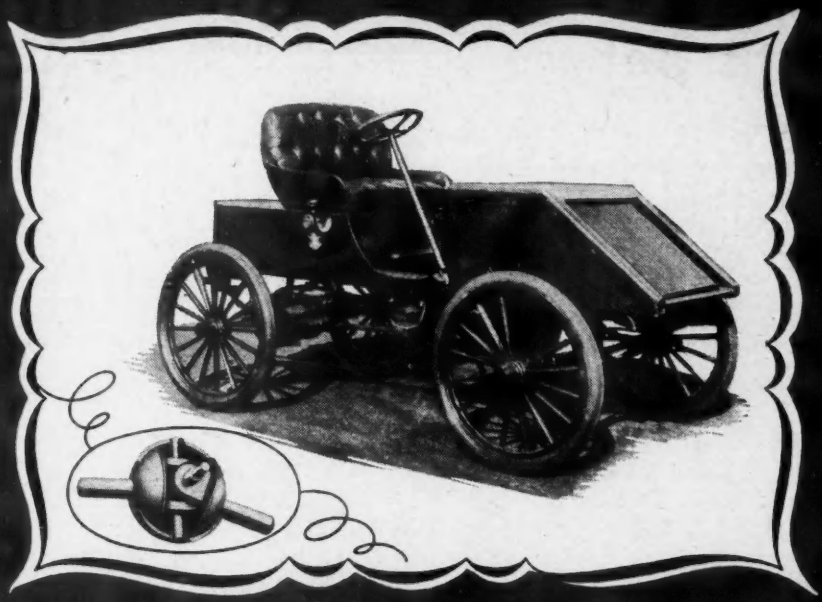
Detailed materials on changes in lubricants are not available. Apparently, however, Avtol 10 (which corresponds approximately to SAE 50) remains the basic motor oil, although recommended practise for the new GAZ-51 engine, for instance, calls for Lubricant Oil SU with 30 per cent Spindle Oil ET or Turbine Oil L added at low temperature. (See Table III) Data on the specifications of these lubricants or their general availability are not at hand. It has been published, however, that a new grease (A Sh-28) for hypoid and other vehicular gears with pressures up to 56,800 psi is in production. The grease is a calcium-synthetic fatty-acid soap in a suspension of acidified petrolatum. Its Engler viscosity at 100 C is 5.0; maximum pressure sustained, 113,600 psi according to official specifications.

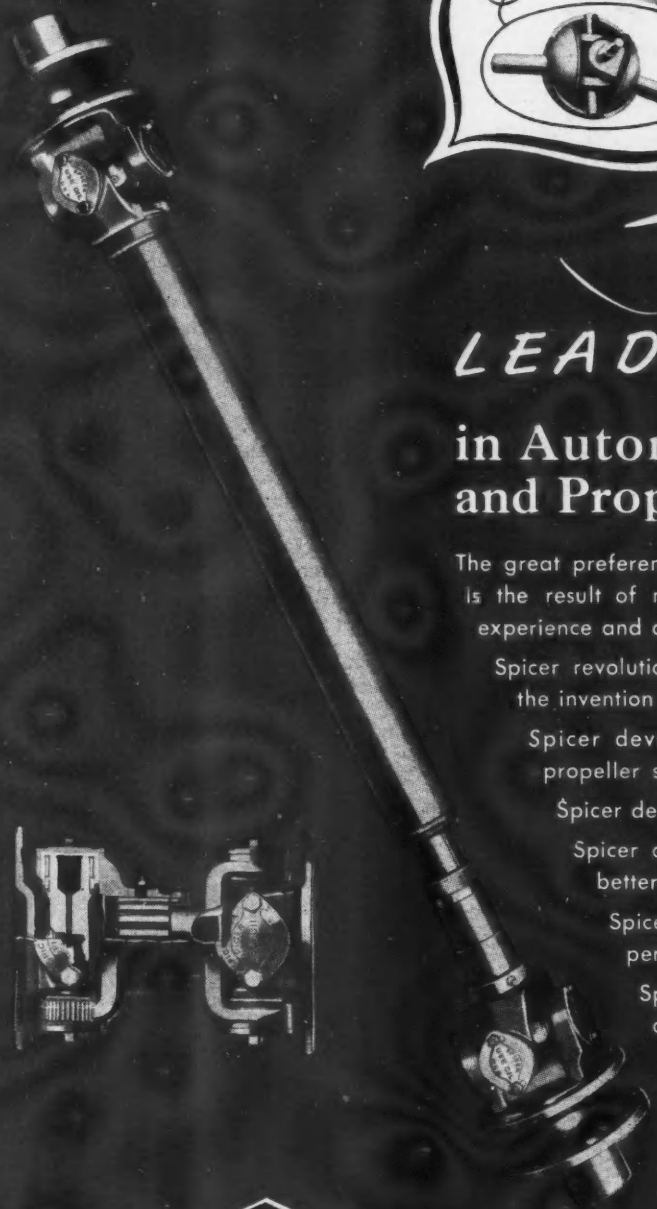
In general, it is clear that radical improvement of Soviet gasolines, particularly, is not taking place. This fact will place an increasingly heavier burden on the economic operation of Soviet motor vehicles. At the same time, it may accelerate use of natural gas and liquefied butane-propane as fuels, a project in which the USSR

(*Turn to page* 60, *please*)

Spicer

The pictures at the right illustrate the first Spicer Universal Joint and the Spicer automobile in which its efficiency was proved.





The Pioneer LEADS THE WORLD

in Automotive Universal Joint and Propeller Shaft production!

The great preference for Spicer Universal Joints and Propeller Shafts is the result of many exclusive advantages, both in manufacturing experience and design.

Spicer revolutionized automotive power transmission in 1904 with the invention of the first practical universal joint.

Spicer developed the telescoping action so necessary in propeller shaft action.

Spicer developed the flange yoke and companion flange idea.

Spicer developed the outer casing of universal joints for better lubrication and protection.

Spicer introduced spring retainers that automatically compensate for packing wear.

Spicer pioneered the tubular shaft which enabled large diameters to be used with light weight.

Spicer developed the I-G type joint to seal in lubricant.

Spicer perfected cageless roller bearings, giving the Spicer Universal Joint far greater load capacity at higher speeds with less friction than any other type of similar product.

Today . . . the pioneer still leads the world!

44 YEARS OF Spicer SERVICE

SPICER MANUFACTURING • *Division of Dana Corporation*
TOLEDO 1, OHIO

TRANSMISSIONS
TORQUE CONVERTERS

PASSENGER CAR AXLES • CLUTCHES • PARISH FRAMES • STAMPINGS • UNIVERSAL JOINTS
SPICER "BROWN-LIPE" GEAR BOXES • RAILWAY GENERATOR DRIVES

Automobile Industry

(*Continued from page* 58)

is showing great interest.

Plans and Performance

Soviet production plans have regularly exceeded actual performance by a considerable margin. The First Five-Year Plan called for 125,000 vehicles to be produced in 1932, later scaling this down to 75,000. Actually 33,000 were manufactured, including 10,000 assembled from foreign parts. The Second Five-Year Plan accomplished its goal in the total number of vehicles to be produced in 1937: 200,000 but failed miserably in the production of spare parts and accessories, especially tires. The Third Five-Year Plan anticipated a production of 400,000 vehicles in 1942, with the annual increase from 1937 being the following:

1938—211,300
1939—227,100
1940—260,000
1941—308,100
1942—400,000

In fact, however, production decreased slightly after reaching its goal in 1938, and amounted only to 208,000 vehicles in 1940. For 1946, the goal is believed to have been 220,000 vehicles and accomplishment was about 165,000 vehicles.

Plans for the expansion of capacity have met even greater difficulties. The Second Five-Year Plan included the expansion of Yaroslavl to a capacity of 25,000 trucks annually, and the construction of truck plants at Ufa, Stalingrad, and Kuibyshev with an aggregate capacity of 225,000 trucks, none of which was realized. The plan met with corresponding failure in the construction of automotive repair plants, for which 515 million rubles had been allocated to complete nine and construct 24 plants, as well as to build 162 service stations. By 1937, only the completion of the nine plants had been achieved, at a cost of 100 million rubles. The Third Five-Year Plan contemplated building assembly plants in the Ukraine, Urals, Siberia, Far East and Central Asia. Up to the present time, only the Urals plant has achieved partial operation, while the Siberian (Novosibirsk) factory is under construction. In addition, a plant not originally proposed, at Ulyanovsk on the Volga, is being built.

The Fourth Five-Year Plan now proposes expanding the GAZ, ZIS and Yaroslavl factories, completing those at Miass, Ulyanovsk and Novosibirsk, and building new factories at Kutaisi (Georgia), Minsk (Byelorussia) and in the Ukraine, as well as completing four assembly plants—all by 1950. Capacity at that date is to be 750,000 vehicles per year, with a production of 500,000 vehicles. In view of past performance, realization of this goal is scarcely probable.

(Part II dealing with production and design trends, and specifications of USSR motor vehicles is scheduled to be published in the next issue of AUTOMOTIVE INDUSTRIES.)

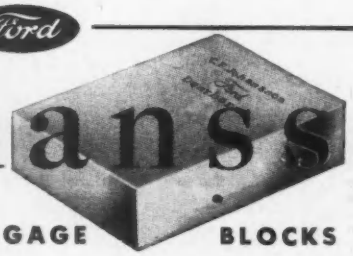
Busy days ahead!
Better send your GAGE BLOCKS in for INSPECTION!
ITEMIZED
CERTIFICATE OF INSPECTION
Shows you which blocks, if any, are inaccurate and the extent of inaccuracy. Issued with each inspection.

IT MAY be that long service or careless handling has worn many of your most-used gage blocks until they're 'way out of tolerance. It pays to know which blocks need reconditioning or replacement. Send your whole set of blocks in to Ford for inspection. Cost is only 25 cents a block for "A" and "B" blocks up to one inch, or for each inch of length of longer blocks. (Minimum charge $1.) Details, methods, costs, of reconditioning your gage blocks, including the Ford chrome-plating method, sent on request. Write—

FORD MOTOR COMPANY • JOHANSSON DIVISION
3602 Schaefer Road, Dearborn, Mich.

Ford

Johansson



GAGE BLOCKS

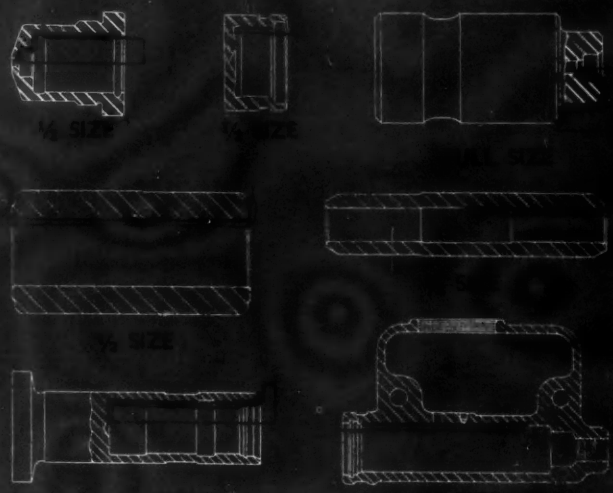
CALENDAR

Conventions and Meetings

International Sports, Travel and Boat Show, Chicago .....Feb. 27-Mar. 7
Tool Engineers Industrial Exposition, Cleveland .....Mar. 15-19
Chicago Production Show, Chicago Mar. 22-24
The Inst. of the Aeronautical Sciences Natl. Flight Propulsion Mtg., Cleveland .....Mar. 26
Natl. Assoc. of Corrosion Engineers Mtg., St. Louis.....Apr. 5-8
Southern Mch. & Metals Exposition, Atlanta .....April 5-8
Chamber of Commerce of the U. S. Annual Mtg., Washington, D. C. April 26-29
32nd International 500-Mile Race, Indianapolis .....May 31
Natl. Air Races, Cleveland.....Sept. 4-6
Instrument Soc. of Amer. Natl. Instrument Conf. & Exhibition, Phila. .....Sept. 13-17
Commercial Motor Transport Show, London .....Oct. 1-9
Society of Motor Mfrs. International Motor Exhibition, London Oct. 28-Nov. 6

New boring and turning machines TO BROADEN YOUR PROFIT MARGIN

Model 36



On one of the parts illustrated the bore specifies a .0005 back taper. Many bores have a .001 total limit. On one job the production rate is 1,080 pieces per hour; on another, production was increased from 180 to more than 300. Specifications for the valve guide call for a .0001 limit on size from one end to the other, .0002 for concentricity, and a .0006 limit from piece to piece.

Money-saving speed, accuracy and ease of operation make this new line of precision contour turning and boring machines earn their way. Cam and air actuated, the tools positively repeat from piece to piece unaffected by temperature variations.

High production is assured by high spindle speeds and lifetime sealed lubrication of spindle bearings, and by the fact that 2 or more pieces are finished simultaneously with rapid traverse on all idle motions.

An unlimited variety of set-ups can easily be arranged. In addition to straight boring and turning, facing and chamfering, it will accurately follow contours cut on its cams, and will produce lands, recesses, flanges, steps, counterbores, and radii . . . all with a single point tool. Only one dimension cut by this tool requires inspection.

The Machine Tool Show unquestionably demonstrated the enormous new possibilities of automatic machinery. Are you falling behind your competitors by not at least investigating? We will gladly show you how we are changing expensive boring and turning operations into profitable productivity. *Productivity, not price, is the measure of a machine.*

NEW BRITAIN AUTOMATICS COST LESS PER FINISHED PIECE.

THE NEW BRITAIN MACHINE CO.

NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

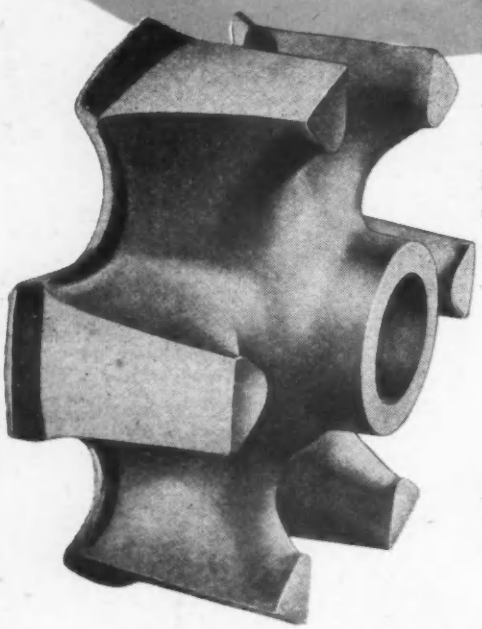
248MJI

perMold ALUMINU

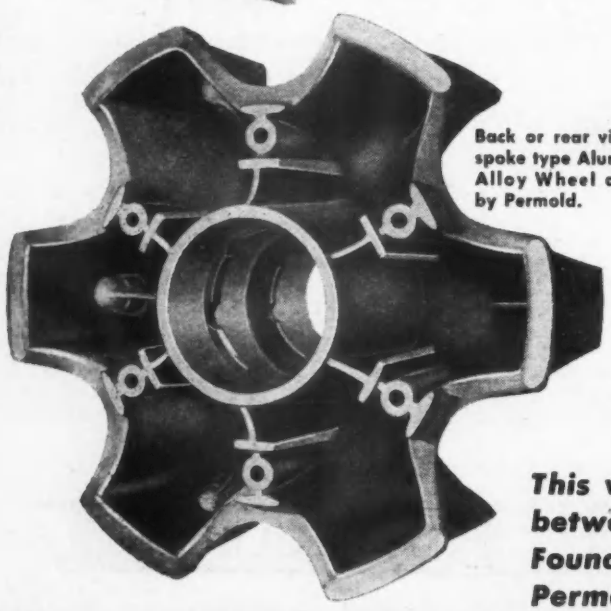
WHEEL WEIGHT COMPARISONS
(20 Inch Trailer Wheels—Spoke Type)

	Weight of Wheel As Cast	Weight Complete Wheel Assembly
CAST STEEL WHEEL	80 lbs.	190 lbs.
ALUMINUM SAND CAST WHEEL . . .	54 lbs.	150 lbs.
PERMOLD ALUMINUM ALLOY WHEEL	32.6 lbs.	135 lbs.

Aluminum wheels greatly reduce weight. But Permold Aluminum Alloy Heat Treated Wheels, where quantities make permanent mold practical, permit an even greater reduction of weight of the wheel as cast and of the complete wheel assembly. These wheels require less metal to produce and permit an equivalent reduction in machining.



Outside or front view of spoke type Aluminum Alloy Wheel as cast by Permold.



Back or rear view of spoke type Aluminum Alloy Wheel as cast by Permold.

Here are actual Road and Load Performances of Permold Aluminum Alloy Wheels

Permold Aluminum Alloy Wheels are in continuous operation on a common carrier trailer running between Toledo and Chicago. These wheels are giving utmost satisfaction and have now gone over 82,000 miles.

On another trailer Permold Aluminum Alloy Wheels have traveled over 140,000 miles. Trailer loaded with 28 tons of coiled copper wire tipped over in wreck, yet Permold Aluminum Alloy Wheels withstood this severest of all punishment without any indication of failure. These wheels are now on a trailer and have traveled over 30,000 miles since the wreck.

Numerous other Permold Aluminum Alloy Wheels are now operating daily on common carrier trailers on regularly scheduled runs in many sections of the country. These wheels are performing satisfactorily under a wide variety of service conditions.

* * *

The statement has been made that for every pound reduction of non-pay load, operating costs decrease one dollar per year. On this basis the weight saving effected by Permold Aluminum Alloy Wheels offers an additional opportunity to reduce operating costs.

This wheel is the result of collaboration between the engineers of The Dayton Steel Foundry Company, Dayton, Ohio, and the Permold Foundry and Metallurgical staffs.

perMold

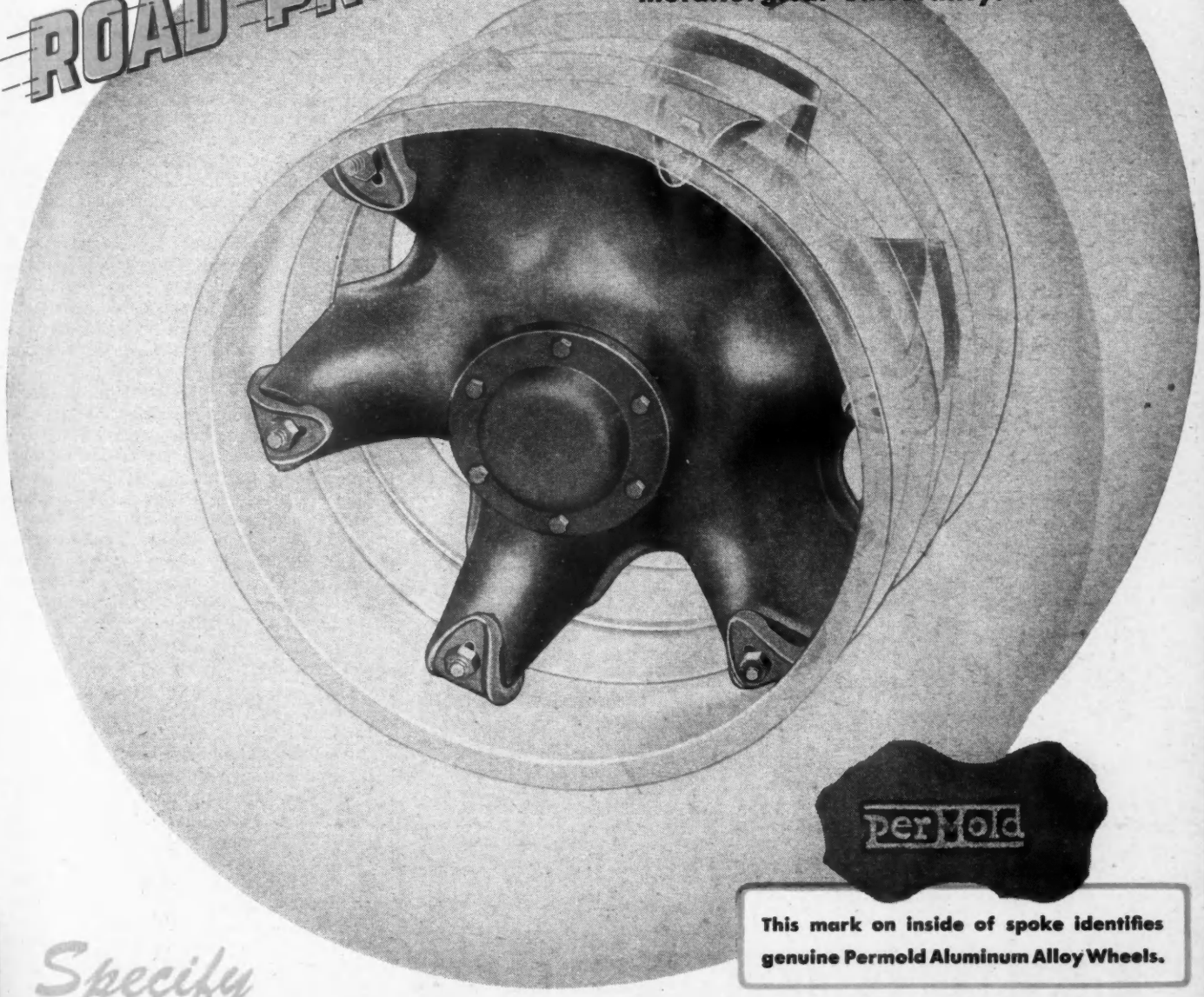
THE PERMOLD COMPANY
Permanent Mold Aluminum Alloy Castings
MEDINA, OHIO

ALLOY WHEELS

Reduce Weight Up To 55 lbs. Per 20 Inch Wheel Assembly

LOAD PROVED!
ROAD PROVED!

The casting of Permold Aluminum Alloy Wheels is made possible by skill and experience — 27 years of foundry experience — utilizing the correct alloy, heat treating to obtain maximum strength, and with constant quality control for metallurgical uniformity.



perMold

This mark on inside of spoke identifies genuine Permold Aluminum Alloy Wheels.

Specify

perMold **ALUMINUM ALLOY WHEELS**

New GM Supplier

(*Continued from page 29*)

edges or corners not readily reached by the polishing wheels as finished by hand.

The next major operation both on steel parts and die castings is electroplating in the modern plating department installed here. As is customary, the functioning of plating equipment is completely automatic and conveyorized throughout. One unusual feature is the arrangement making it possible to plate either steel or die cast parts in batches in the same machine, although at different times, of course.

Another noteworthy feature of the plating department is in the management of steel parts which require heavy coatings capable of withstanding scuffing as well as the corrosion resistance expected of external parts. Bumper parts require a heavy deposit of copper as well as nickel, and heavy copper deposition takes time and considerable equipment. To simplify the arrangement of the main plating machines, as well as to hold the length of plating lines to reasonable limits, a large automatic copper plating machine has been installed off the main line.

All steel parts in this department are routed to the copper plating machine, first, for the heavy coating. They come to the machine in baskets hung on the feeder monorail, go through the plating cycle, then are re-loaded in the same baskets for processing over the buffing line. In the main plating machine the steel parts receive the bright copper coating, bright nickel, and finally the chromium flash, including the various incidental steps of cleaning and rinsing. The die-cast parts take only the cycle through the plating machine—of copper, nickel, and chromium without intermediate buffing or color.

In the final stage provisions are made for spraying the interior cavity of steel parts with an aluminum paint, and striping or color stenciling of die castings. To accomplish this, parts as they come out of the plating machine are placed on a metal mesh conveyor belt and move between two rows of small water wash spray booths. Each operator handles a specific part which is removed from the conveyor and replaced on the conveyor as the operation is completed. The conveyor proceeds on its course and carries the various parts under an infra-red lamp canopy for drying within the short time interval. At the end of the line the parts are visually inspected and packed immediately.

One of the interesting detail operations in this department is an application of the Vapor-Blast machine for an intermediate operation on radio grilles. This grille specifies a satin finish on the central section, leaving the outer outline in bright chromium. To this end, the grilles are removed from the plating machine after the application of bright nickel and before this part goes to the chromium section of the tanks. The grilles are laid on a small conveyor which carries them through the Vapor-Blast cabinet and out again. After satin-finish the grilles are loaded on the plating conveyor for cleaning and chromium plating.

At the other side of the plant is the hub cap department. Hub caps are made in two pieces—the steel body, drawn from round steel blanks; and the outer decorative cover which is pressed from thin brass blanks. The steel body is cleaned and de-greased after forming and goes through an automatic plating machine for a zinc coating. The cover is routed to another electroplating machine for a complete cycle of nickel and chromium coatings. Following electroplating of both the cover and body, the two are pressed together to make the permanent assembly.

Hub caps now go to a rather unique process line. Generally the divisional

(*Turn to page 66, please*)

ONE SOLVENT...

for all Metals or Combination of Metals

NEW SCIENTIFICALLY IMPROVED

BLACOSOLV

FOR SOLVENT VAPOR DEGREASERS

No need to use a special solvent for cleaning a combination of metals—BLACOSOLV degreases them all . . . Safely . . . Quickly . . . Economically.

BLACOSOLV is the most highly stabilized solvent . . . ideal for aluminum, magnesium, brass, copper, steel, etc., either individually or in combination. It is non-inflammable—is positively safe—will not stain or dull even the most highly polished surfaces . . . the one price solvent for all metal degreasing jobs. Its economy is increased in the uninterrupted service it affords you in your production.

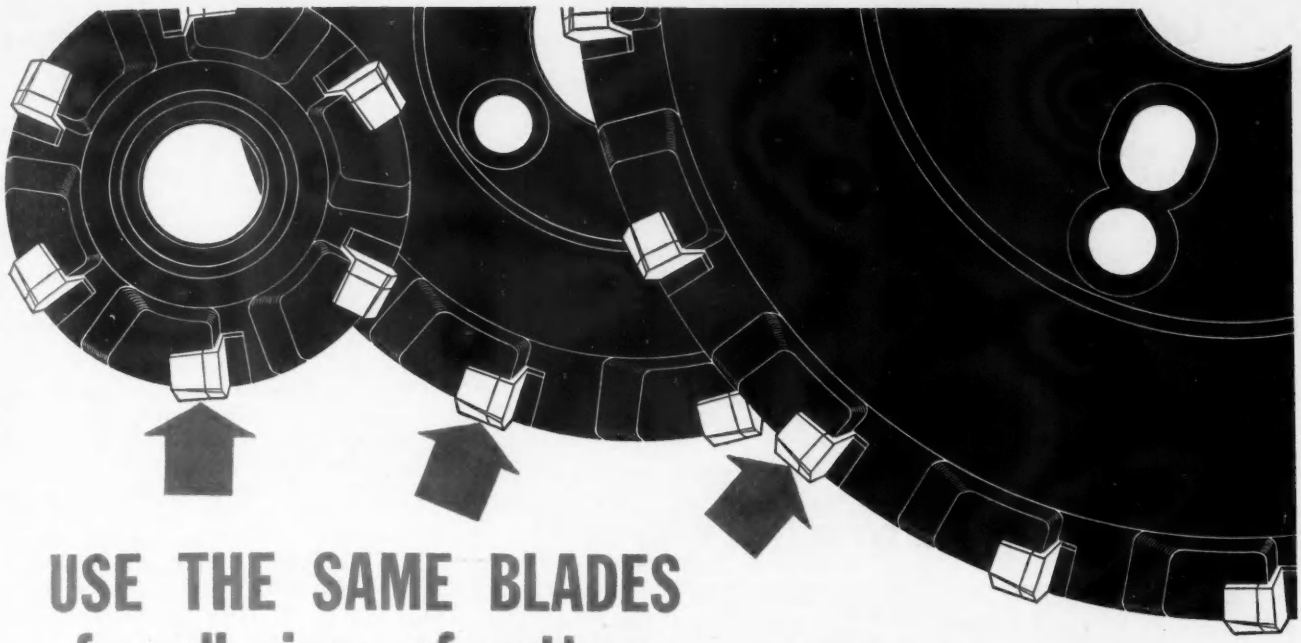
Write today for FREE BOOKLET ON Degreasers and application with Blacosolv the all purpose degreasing solvent.

G. S. BLAKESLEE & CO.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.



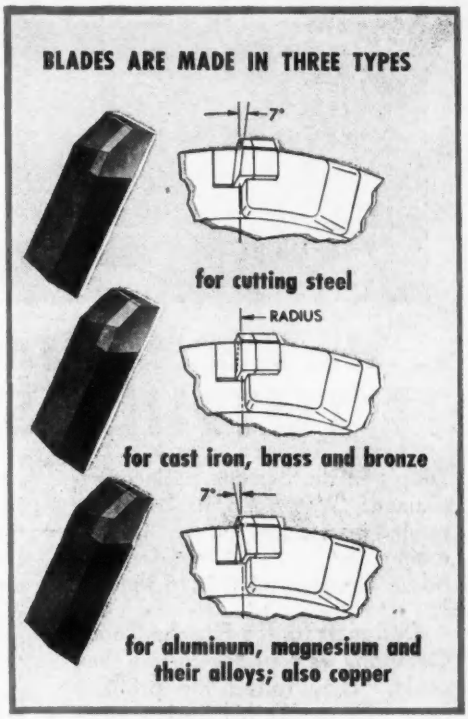
USE THE SAME BLADES for all sizes of cutters

Standardize on E-Con-O-Mill for all your face milling needs and achieve several substantial savings in operating cost.

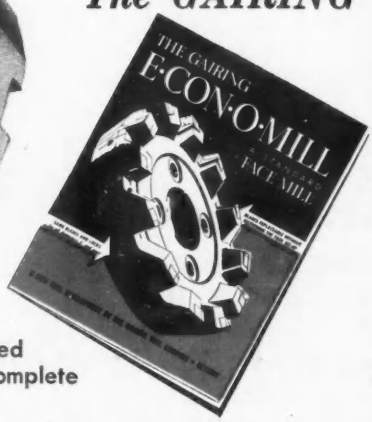
You cut down your tool inventory by stocking blades (and locks) which fit all cutter bodies, made in standard sizes 5-inch diameter and over.

You reduce down-time of your machines by having blades replaced without removing the cutter from the machine. All blades are furnished ready to go to work, and may be re-sharpened individually on a carbide grinder by using a standard checking gage furnished by us. Blades are easily replaced by hand. A standard Allen wrench is the only tool required.

Moreover, these economy features do not interfere with the E-Con-O-Mill being a most efficient tool. Its new design incorporates the latest developments in cutting tool engineering. Its sturdy construction provides truly one-piece rigidity.



PATENT APPLIED FOR



WRITE FOR illustrated folder which gives complete data and prices

The GAIRING

E-CON-O-MILL

A New Carbide Face Mill
Made in Standard Sizes
5-inch Diameter and over

REDUCE DOWN-TIME OF YOUR MACHINES

CUT DOWN YOUR TOOL INVENTORY

The GAIRING TOOL COMPANY, 21221 Hoover Road, Detroit, Michigan

GM Supplier

(*Continued from page* 64)

emblem is finished in several colors—say red and black. At this point there is in line a spray booth, a Detrex degreaser, and a second spray booth. The first spray booth applies one of the colors, using a suitable shield, while the second spray booth applies the second color.

The three pieces of equipment are traversed by a belt conveyor arranged in the form of a Tee with the leg of the Tee terminating some distance from the spray booths. The work moves on the Tee-shaped belt line from one spray booth to the next, and is removed from the belt by operators seated along the sides. Meanwhile, the shields are laid on the conveyor and picked up by the operator at the degreaser for degreasing to keep them clean and usable, removing accumulations of paint. Following spraying, the hub caps move on a conveyor belt under a canopy of infra-red lamps for thorough drying. The work is then inspected by operators seated along the conveyor, and proceeds immediately to the packing stations at the end of the line.

For the ride of a lifetime . . .

. . . the Fitzjohn designers agreed on

TUTHILL SPRINGS

People in the bus line business explained: "We need to keep our paying passengers happy. They're asking for a more comfortable ride. Can you give it to them?"

Designers for the Fitzjohn Coach Company were pretty certain they could. They talked the problem over with the Tuthill Spring engineers. Then they went to work. The result is shown above: the Fitzjohn Duraliner—comfort, plus.

The Tuthill engineers couldn't take the bumps themselves out of roads, but they did the next thing to it. They installed Tuthill progressive leaf springs on the bus. Hit a small bump, and the light upper section absorbs the jar. Hit a big bump, and every leaf in the powerful lower section sees action, too. All the easiness of baby buggy springs. All the brute strength of earthmover springs.

Bring your own spring problems to Tuthill. Tuthill has 68 years of intelligent experience in this field. Benefit from Tuthill's highly specialized knowledge. Write today.

Tuthill makes a complete line of leaf springs

WE RECOMMEND TUTHILL FOR QUALITY SPRINGS

TUTHILL SPRING CO.

760 W. Polk St.
CHICAGO 7, ILL.

Quality Leaf Springs for Sixty-eight Years

Testing Viscous Dampers

(*Continued from page* 43)

may be mounted.

A permanent-magnet pickup coil is placed above one of the driving arms in such a way that its electrical output is in proportion to the degree of rotary motion of the arm. The output of the pickup coil is led to the input of the amplifier unit where it feeds two channels; the first is a vacuum-tube voltmeter which indicates on a meter scale the double amplitude of vibration. The second is the amplifier itself which includes an amplitude limited to stabilize the control, and voltage and power amplifiers feeding the exciting coils with a power of about 100 watts. It may be seen from the above description that this is a self-excited oscillating device in which the feedback of energy from output to input is effected through the mechanical linkage of the shaft and mass combination vibrating at its natural frequency. The natural frequency of the combination used here was chosen to be close to that of the 5GA crankshaft, around 270 cycles per second. With a damper in place, the frequency falls to approximately 250 cycles per second, as it does on the engine.

The amplitude of vibration is determined by the power applied to the exciting coils, and by the total amount of damping present in the vibrating system. When low-hysteresis steel is used to make the shaft, as was done here, the vibration with dummy load can rise to a high value with relatively low input power. Replacement of the dummy by a real damper produces a significant reduction in amplitude, since it adds greatly to the total amount of damping present. Testing of dampers on this device, then, is a process of comparing them as to their ability to hold down the vibration amplitude with a constant amplifier power output.

Painting Aluminum Buses

(*Continued from page* 41)

ferred to tracks moving into 45 by 16 by 16 ft painting rooms, and thence into baking ovens of similar size. As many as three colors can be sprayed simultaneously, under ideal working conditions. Principally lacquer is used on coach interiors. After paint sets a few minutes, coaches are unmasked and moved into the baking ovens.

This procedure is repeated until each coach has its complete scale of colors, running up to seven and more some times. Of course lettering and numbers are applied separately, by hand. After all painting is done, all masking is cleaned off and hardware and glass are wiped with a rubbing compound for polishing.

For a **COMPLETE LINE OF SOLDERS** in any composition or any shape . . . for the answer to any joining problem . . . for fast deliveries and friendly service . . . call the nearest Federated office.

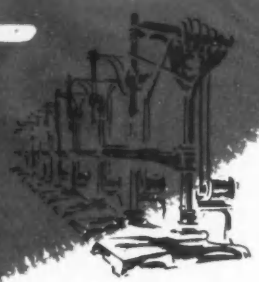
All of Federated's 25 sales offices and 11 plants are linked . . . joined . . . in a common purpose—to bring you the advantages of the uniformly good facilities which this huge organization maintains.

BALTIMORE, MD.
BECKEMEYER, ILL.
BIRMINGHAM, ALA.
BOSTON, MASS.
CHICAGO, ILL.
CINCINNATI, OHIO
DALLAS, TEXAS
DENVER, COLO.
DETROIT, MICH.
EL PASO, TEXAS
HOUSTON, TEXAS
LOS ANGELES, CALIF.
MILWAUKEE, WISC.
MINNEAPOLIS, MINN.
NEWARK, N.J.
NEW YORK, N.Y.
OSHKOSH, WISC.
PERTH AMBOY, N.J.
PHILADELPHIA, PA.
PORTLAND, ORE.
ROCHESTER, N.Y.
ST. LOUIS, MO.
SALT LAKE CITY, UTAH
SAN FRANCISCO, CALIF.
SEATTLE, WASH.
TRENTON, N.J.
WHITING, IND.
CLEVELAND, OHIO
PITTSBURGH, PA.

Federated
METALS DIVISION
AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY NEW YORK 5, N. Y.

HOW LONG-

SINCE YOU'VE WRITTEN OFF YOUR OLD DRILLING MACHINES?



MODEL C-20 SIBLEY
20" SWING DRILLING MACHINE

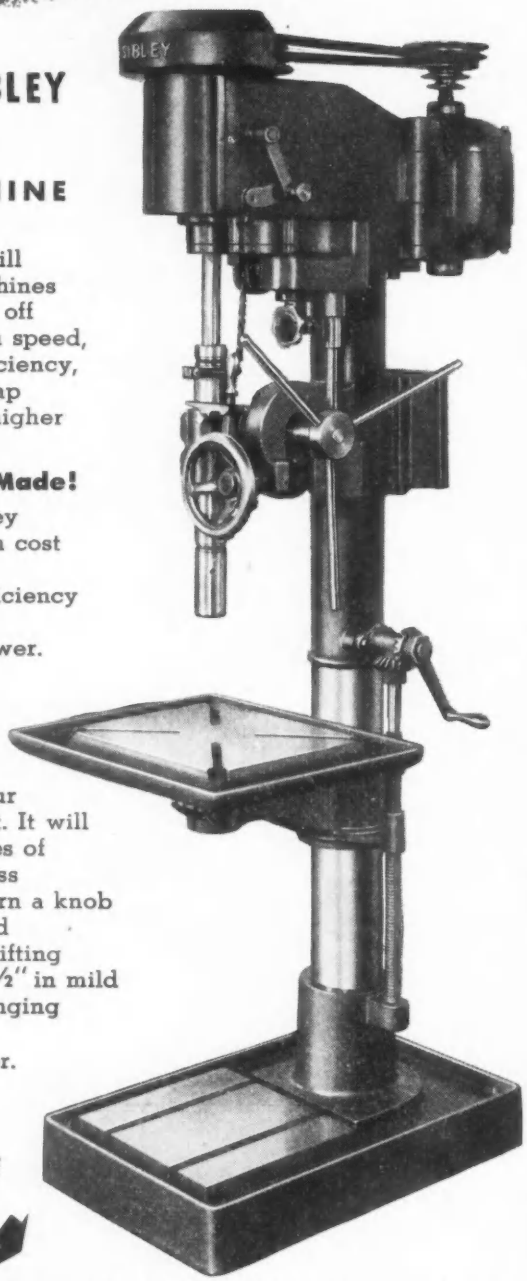
Many manufacturers are still operating old drilling machines whose costs were written off years ago. Now obsolete in speed, accuracy and operator efficiency, they are a decided handicap in paring costs to offset higher labor rates.

Cost Savings Can Be Made!

The new model C-20 Sibley will furnish you savings on cost per piece by—

1. Increased operator efficiency and output.
2. Greater speed and power.
3. Finer accuracy.

Install a new model C-20 in your plant and make a Time and Motion Study comparison with your present drilling equipment. It will demonstrate the advantages of such features as easy access to controls—where you turn a knob to select the proper geared power feed; convenient shifting of V-belt; power to drill 1½" in mild steel; 8 spindle speeds ranging from 65 to 1360 R.P.M. powered by a 2 H.P. motor.



GET COMPLETE INFORMATION ON THE SIBLEY MODEL C-20

SIBLEY
MACHINE & FOUNDRY CORP.
10 EAST TUTT STREET
SOUTH BEND 23, INDIANA

SIBLEY MACHINE & FOUNDRY CORP.
10 E. Tutt St., South Bend 23, Indiana
Send Catalog No. 67, Free!

NAME_____

ADDRESS_____

CITY_____ STATE_____

Publications

(*Continued from page* 56)

ties and weldability values using various Ampco bronze electrodes. The bulletin is illustrated with typical applications, diagrams and sketches.

H-32—Fiberglas Plastics

Owens-Corning Fiberglas Corp.—A new 36-page booklet containing up-to-date information on the properties of Fiberglas-reinforced plastics, their range of applications, economics of their manufacture and use and manufacturing methods is available. Tables of the properties of Fiberglas cloths and mats employed to reinforce plastics are included. The booklet is illustrated with numerous photographs covering applications and manufacturing methods.

H-33—Valves

The Parker Appliance Co.—A comprehensive catalog, No. 301, describes valves for industrial hydraulics and fluid handling. The 52-page catalog lists engineering, specification and application data—with illustrations—for all types of globe, needle, check, relief and plug valves manufactured by the company. An additional section gives information on other specialized valves and accessories for power application and instrumentation.

H-34—Carbide Tipped Tools

Whitman & Barnes—Catalog No. 101 lists and illustrates various types of carbide tipped tools, including straight and taper shank spiral fluted drills, core drills, glass drills, drills for drilling hardened steel, etc. In addition, several tools of standard, as well as special design are illustrated. Information is given on the use and care of carbide tipped tools, proper speeds, feeds and grinding recommendations.

H-35—Stiffness Testers

Tinius Olsen Testing Machine Co.—Bulletin No. 35 announces the company's complete line of Stiffness Testing machines. Factual data is given on the various types of tests and applications made possible by the use of these machines, together with procedure for production and research testing, explanatory charts and useful formulae.

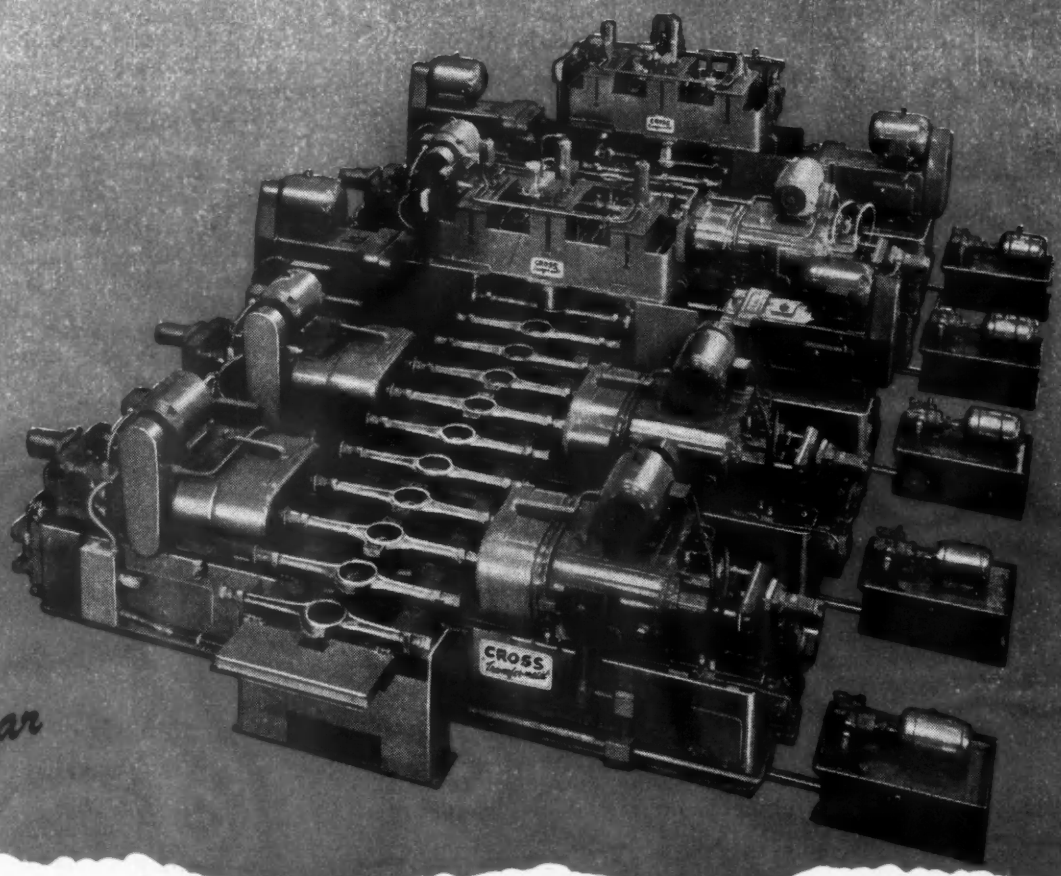
Borg-Warner Int'l to Direct Asbestos Mfg. Co.'s Exports

The export activities of the Asbestos Manufacturing Co. will be directed by Borg-Warner International Corp., Chicago, according to a recent joint announcement.

Performance!

1 Operator • *150* Axle Housings Hourly

- Bores, *turns,* and faces two housings at both ends simultaneously.
- Continuous automatic cycle paces production.
- Utmost flexibility to meet changes.
- Simplified maintenance to reduce down time.
- Low capital investment.



Rear

THE **CROSS** COMPANY

Established 1898

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

New Products for Aircraft

(*Continued from page* 54)

port is furnished by two spanwise spars spotwelded to the skin. This combination of stretched and spotwelded stainless steel provides high resistance to fatigue and close control of airfoil contour. Leading edge rigidity and static balance are obtained by a spanwise strip spotwelded to the inside curve of the blade and lined with lead counterweighting.

Construction behind the main spar is a cyclewelded "sandwich" of Formica between two sheets of .0015-in. stainless steel. This laminated skin covering, very light in weight and very stiff, is riveted to ribs to complete and hold the airfoil contour.

Although extremely light in weight, the new metal blade is claimed to present maximum resistance to distortion under load. Good aerodynamic characteristics are provided by tapering the blades in planform and thickness for increased efficiency at the tips.

Features of its construction make it practical for chordwise and spanwise balance of individual blades to fine tolerances and permit balancing of all three blades on the rotor to within .004 lb of each other.

Normal or cruising rpm of the new blades is 194 and maximum design rpm is 258.

K-36—Versatile Sealing Tape

Nu-Chromseal tape, a versatile improved form of Chromseal aircraft sealing tape, developed by Pittsburgh Plate Glass Co., Pittsburgh, Pa., for wartime requirements, will be offered for a wide range of industrial applications.

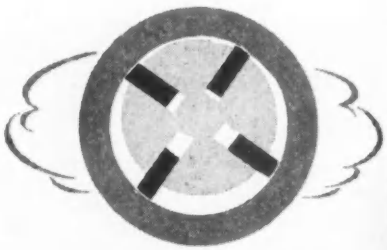
Nu-Chromseal, now being made available in three thicknesses, is not affected by gasoline, oil or water and may be used where required baking temperatures run as high as 375 deg. It is adhesive on both sides, clean to handle and rates high in dielectric values.

Chromseal was used during the war for sealing pressurized cabins, fuel tanks and plastic enclosures. Nu-Chromseal, in addition to numerous aircraft applications, is said to be advantageous for automobile weatherproofing, boat and container sealing, metal cabinetry, gaskets, glazing and insulation purposes.

K-37—Tire Changer

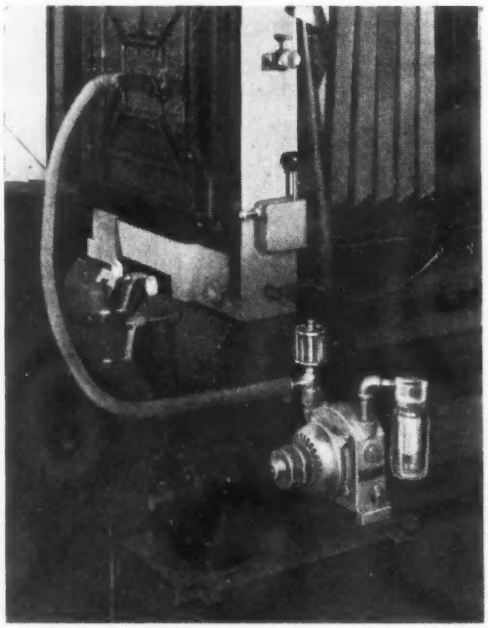
A new tire changer, manufactured by E & G Machine & Tool Co., Freeport, N. Y., and distributed by Air Associates, Inc., of Teterboro, N. J., is said to enable servicemen to remove and mount aircraft and truck tires quickly, with minimum effort. Moreover, this method of tire handling prevents injury to tires and wheels, and provides maximum safety for operators. With this tire changer, aircraft tires up to 56 in. in diameter can be mounted and demounted on both demountable flange and drop-center wheels. Special attachments are available for servicing tires up to 72 in. It is claimed that two average operators can remove or mount a large tire in seven or eight minutes.

E & G tire changer



PROBLEM:

How to get a fast-action, positive vacuum to hold up to 6 sq. ft. of film uniformly flat. *Solved:* By the nation's largest manufacturer of lithographers' copying cameras—with a Gast 25F70 vacuum pump. *Result:* Positive, pulseless holding of film that helps assure uniform, high quality negatives — and eliminates costly work spoilage.



Can You Use VACUUM AS PROFITABLY AS THIS?

YOUR original equipment problem may be far different from this. But if you need a dependable vacuum source (up to 28 in.), you're apt to find exactly what you want in Gast's line of Rotary Vacuum Pumps.

They're outstandingly simple, service-free, and adaptable. On machines as different as printing presses, embalmers' pumps and lithographers' cameras, Gast Rotary Pumps improve product performance. They've proved their superiority as vacuum sources for materials handling, equipment control, and many other jobs. And they're widely used on special independent or portable units.

Just write us, describing how vacuum or compressed air might be applied on your product. We'll cooperate to solve your problem.

Vacuum Pumps (to 28 in.), Compressors (to 30 lb.), Air Motors (to 1 h. p.)

Most deliveries made from stock.

WRITE TODAY
Request your copy of this IDEA-CATALOG.

GAST ROTARY AIR MOTORS COMPRESSORS VACUUM PUMPS

GAST MANUFACTURING CORP.
129 Hinkley St., Benton Harbor, Mich.

EXPLOSIVE RIVETS

SAVE 18 HOURS' ASSEMBLY TIME

for leading truck manufacturer

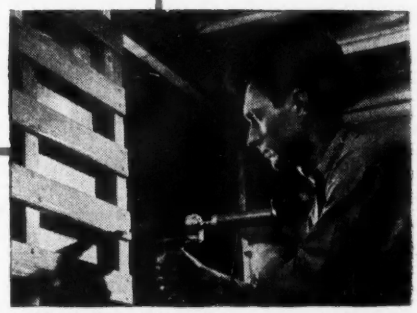
When Barry & Baily, Philadelphia —custom truck body builders—decided to use Du Pont Explosive Rivets in place of machine screws on many of their fastening jobs, they made an important discovery: these modern, versatile fasteners saved up to 18 hours per unit!

In attaching oak slats to interior aluminum stringers on truck frames, 500 fasteners are required. Using machine screws, the assembly took 24 hours. Explosive Rivets do the same job, better and easier, in only 6 hours . . . saving more than $28.00 on each truck.

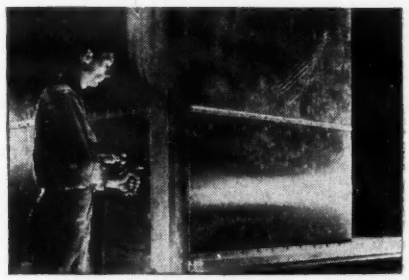
Explosive Rivets meet practically every fastening need in the plant. They're ideal for blind fastening . . . places hard-to-reach, and open work on custom jobs ranging from tiny Good Humor carts to giant 33-foot trailers in which more than 1000 Explosive Rivets are used. And yet, these Rivets cost no more than the ordinary fasteners this manufacturer formerly used.

Find out—now—if *you* can use Explosive Rivets profitably in your own plant. Our engineers will help. Write, wire or phone a brief description of your fastening operations. Ask for catalog A-85.

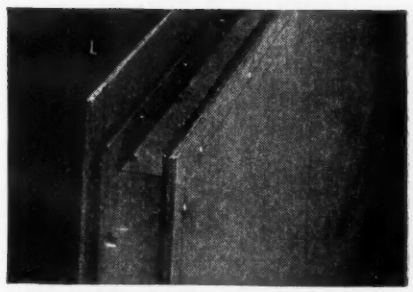
E. I. DU PONT DE NEMOURS & CO. (INC.)
EXPLOSIVES DEPARTMENT
WILMINGTON 98, DELAWARE



SEMI-BLIND JOB—Oak slats quickly fastened to body frame. In one quick operation, electrically heated iron expands charge in shank . . . setting the Explosive Rivet. Rigid drill-hole tolerances are unnecessary.



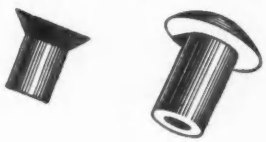
BLIND FASTENING—Aluminum panels readily secured to metal corner posts. Operators easily set from 15 to 20 Explosive Rivets per minute. Made of aluminum alloy, Rivets resist corrosion.

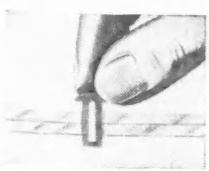


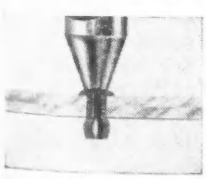
OPEN WORK—Plywood panels easily attached to aluminum door frames. Note smooth finish of Explosive Rivet heads and expanded, barrel-shaped ends that lock Rivets securely in place. Vibration can't work them loose . . . eliminating maintenance.

DU PONT EXPLOSIVE RIVETS

A Product of Du Pont Explosives Research







Easy to use:

First, insert Rivet in prepared hole.

Then, touch tip of Riveting Iron to head of Rivet. Heat fires minute charge in Rivet shank. Shank expands . . . fills hole completely. Barrel-shaped head locks Rivet in place.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Personals

Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.

Ford Motor Co., Lincoln-Mercury Div.—**Robert F. G. Copeland,** appointed Advertising and Sales Promotion Manager.

Ford Motor Co., Parts and Equipment Mfg. Div.—**Carl Scheffler,** named Director of Industrial Relations.

Willys-Overland Motors — **Jack R. Lakin,** appointed General Sales Manager of Drop Forge Div.

American Bantam Car Co.—**Dean B. Copeland,** elected President; **Jerome P. Bowes, Jr.,** elected Chairman of the Board, and **Stanley Winkler,** elected Vice-President.

Douglas Aircraft Co., Inc.—**Donald W. Douglas, Jr.,** appointed Director of Contract requirements, succeeding **Karl Grube,** who has resigned.

Republic Aviation Corp.—**Louis W. Davis** has been appointed to the post of Asst. Director of Public Relations.

Perfect Circle Corp.—The retirement has been announced of **George Keagy,** Hagerstown Plant Manager. **George Myers,** formerly Asst. Plant Manager, has been named to succeed Mr. Keagy.

Chain Belt Co.—**L. B. McKnight** has been elected Vice-President with executive responsibiliay for the Heavy Machinery Divisions, Conveyor and Process Equipment and Construction Machinery Divs. **O. W. Carpenter** has been elected a Vice-President in charge of Finance. **B. F. Devine,** elected Vice-President, Manager of the Construction Machinery Div.

Ethyl Corp.—**Charles E. Colvin** has been made Manager of Purchases of the newly formed purchasing section of the company's manufacturing plant in Baton Rouge.

Stewart-Warner Corp.—**C. W. Grange** has been appointed Director of Public Relations.

Carboloy Co., Inc.—**K. R. Beardslee** has been made Vice-President and Marketing Manager of the newly expanded marketing organization. **J. E. Welte** has been named Sales Manager.

Philco Corp.—**Thomas A. Kennally,** formerly Vice-President in Charge of Sales, has been appointed Vice-President and Asst. to the President, **John Ballantyne. James H. Carmine** has been named Vice-President in Charge of Distribution. **Jos. H. Gillies** appointed Vice-President in charge of Radio Division operations.

E. W. Bliss Co.—**Paul S. Strecker,** made Asst. to the President, **Marshall M. Smith.** Mr. Strecker will continue as Personnel Director and the handling of special administrative assignments. **Jules Muller** has been made Director of Engineering.

Casco Products Corp.—**Alexander G. Wels,** elected Secretary, succeeding **Jack Schenber,** resigned. **John J. Reidy,** Sales Manager of Appliance Div.

Borg-Warner Corp., Ingersoll Steel Div.—**W. A. Sharp** has been named Plant Manager.

Pennsylvania Salt Mfg. Co.—**Thomas W. Cox,** Assistant Secretary.

Newcomb-Detroit Co., **Ian B. MacLellan,** appointed General Manager and **Richard W. Wenzell,** Manager of the Grand Rapids Div.

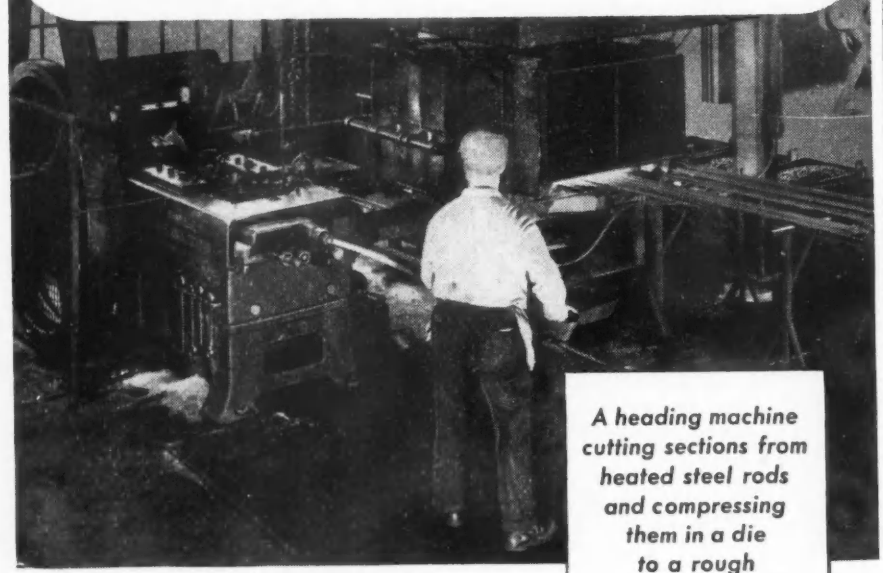
The Firestone Steel Products Co.—**John E. Martin,** President.

Redmond Co., Inc.—**Ned Sebring,** appointed Director of Purchasing; **Lewis Hamlin,** named Executive Vice-President, and **Ralph Redmond,** Director of Sales. **Paul H. Maurer** has been appointed Director of Engineering.

Trailmobile Co.—**John J. Peterson,** Manager of the Buffalo branch.

This is How

STROM BALLS are Born



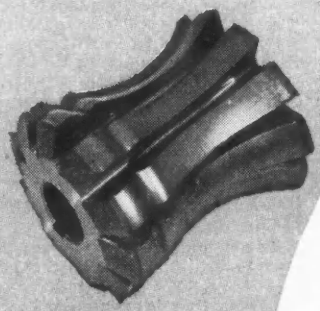
A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape

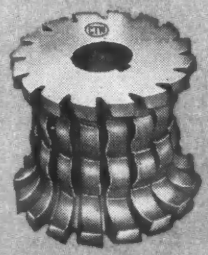
The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of Industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

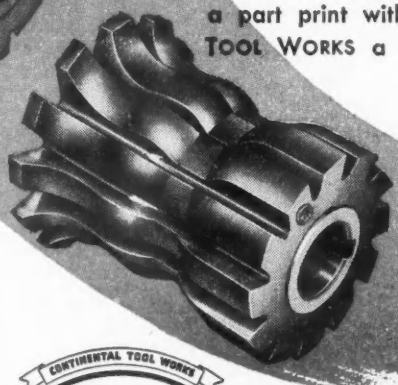
Strom BALLS Serve Industry

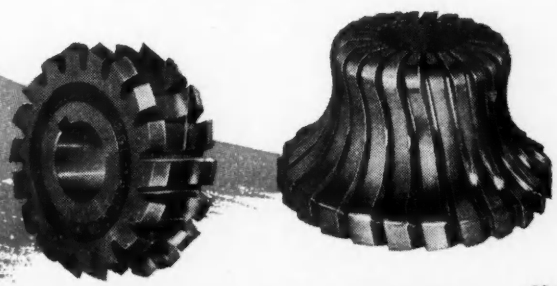
Largest Independent and Exclusive Metal Ball Manufacturer

Call in Continental









THEY HAVE THE "KNOW HOW" AND THE FACILITIES TO DESIGN SPECIAL CUTTING TOOLS TO FIT THE JOB

CONTINENTAL engineers and toolmakers have been designing and manufacturing special cutting tools to customers' specifications for nearly thirty years. With engineering "know-how", complete heat treating facilities, modern machine tools, both standard and special, and skilled operators . . . all under one roof and one management . . . CONTINENTAL is exceptionally well equipped to handle special cutting tool orders. For instance, form relieved cutters, either ground or unground, as illustrated here, can be made to your specifications quickly and accurately. Why not send a tool print, or a part print with information on production requirements to CONTINENTAL TOOL WORKS a division of Ex-Cell-O? You'll find prices reasonable and delivery prompt.

Group of form relieved milling cutters—typical of many special cutting tools designed and manufactured by Continental Tool Works, Detroit 6, Mich.

48—2

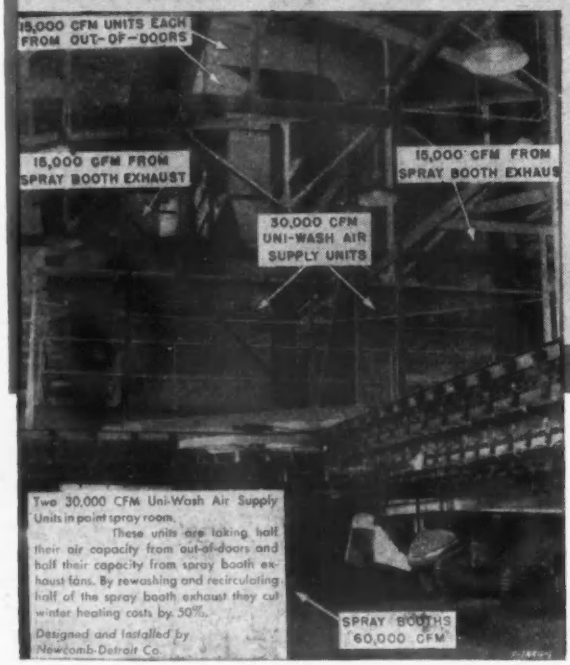
CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

NEWCOMB-DETROIT

Engineered • Built • Installed

2 MILES OF FINISHING SYSTEM


15,000 CFM UNITS EACH FROM OUT-OF-DOORS
15,000 CFM FROM SPRAY BOOTH EXHAUST
15,000 CFM FROM SPRAY BOOTH EXHAUS
30,000 CFM UNI-WASH AIR SUPPLY UNITS
SPRAY BOOTHS 60,000 CFM

Two 30,000 CFM Uni-Wash Air Supply Units in paint spray room. These units are taking half their air capacity from out-of-doors and half their capacity from spray booth exhaust fans. By rewashing and recirculating half of the spray booth exhaust they cut winter heating costs by 50%. Designed and installed by Newcomb-Detroit Co.

The
Auto Industry's Largest Small Parts Finishing System

Newcomb-Detroit engineered, built and installed this huge finishing system recently in one of the large Detroit automotive plants. It consists of 4 identical finishing lines, each 2650 feet long. The parts on each line pass through the following stations: wash, spray bonderite, prime coat (dip), prime baking, finish coat (spray) and finish bake. The four lines are installed side by side and together make up the largest small parts finishing system in the automobile industry.

Newcomb-Detroit is qualified to engineer, build and install finishing systems for all types of industries . . . finishing systems that always provide fine product finish and economical operation.

Re-circulates 50% of Spray Booth Air

The air supplied to the spray booths in this installation is processed in Uni-Wash Air-Supply Units. These units take 50% of the air from the out-of-doors and 50% from the spray booth exhaust. This mixed air is then washed, dried and heated before being delivered to the spray areas, free of fumes and odors. This system effects up to 50% saving in heating expenses during winter months.

Complete details on the entire line of Newcomb-Detroit equipment is contained in this large catalog. Available without obligation upon letterhead request.

Established 1912
NEWCOMB-DETROIT COMPANY

Fabricating Plant
GRAND RAPIDS

Main Office and Plant
5741 Russell Street
DETROIT 11, MICHIGAN

Western Sales Office
CHICAGO

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

Renewed advances in general business activity are indicated. The *New York Times* index for the week ended Jan. 3 stands at 153.3, as against 148.7 for the preceding week and 148.0 a year ago.

Sales of department stores during the week ended Jan. 3, as reported by the Federal Reserve Board, equaled 205 per cent of the 1935-39 average, as compared with 357 in the week before. Sales were nine per cent above the corresponding distribution a year earlier, as against a preceding similar excess of 27 per cent.

Electric power production increased slightly in the week ended Jan. 3. The output was 6.4 per cent above the corresponding amount in 1947, as compared with a similar advance of 8.7 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 682,038 cars, 13.8 per cent more than the figure for the week before but 0.8 per cent below the corresponding number recorded in 1947.

Crude oil production in the week ended Jan. 3 averaged 5,291,237 barrels daily, or 5797 barrels more than the preceding average and 642,487 barrels above the comparable output in 1947.

Production of bituminous coal and lignite during the week ended Jan. 3 is estimated at 11,550,000 net tons, 35.8 per cent more than the output in the week before and 61,000 tons above that reported a year ago.

Civil engineering construction volume reported for the week ended Jan. 8, according to *Engineering News-Record*, is $85,675,000, or 58 per cent more than the preceding weekly figure but five per cent below the comparable sum in 1947. The aggregate for two weeks recorded this year is eight per cent less than the corresponding amount in 1947. Private construction is 30 per cent below that a year ago, but public construction has increased by 21 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended Jan. 3 rose to a new peak of 164.4 per cent of the 1926 average, as against 163.0 for the preceding week and 139.1 a year ago.

Member bank reserve balances decreased $396 million during the week ended Jan. 7. Underlying changes thus reflected include a decline of $861 million in Reserve bank credit and a reduction of $308 million in Treasury deposits with Federal Reserve banks, accompanied by a decrease of $205 million in money in circulation.

Total loans and investments of reporting member banks decreased $489 million during the week ended Dec. 31. A decline of $71 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $14,658 million, shows a net increase fo $312 million in 12 months.

Rumford Retires as Head Of DeSoto

George Rumford has retired as operations manager of Chrysler Corp.'s DeSoto Div. He joined Chrysler in 1932.

Ford Retools

(*Continued from page 39*)

station four the compound angular unit on the left hand side drills through the previously partly drilled holes, and step drills the front end of one of the holes to a larger diameter. At station five the left unit taps the horizontal oil hole while a compound angular unit taps the angular oil hole.

Operations on the valve line are handled in a number of interesting steps, starting with the towering Foot-Burt six-station center column machine for drilling valve throats, valve guide holes, push rod holes, and counterboring. Following this standard operation is a new six-station fly-cutting machine, actually a combination of four W. F. & John Barnes units tooled by Kreuger in the form of a self-contained transfer machine. Stations one and six are for loading and unloading. Station two fly-cuts six valve guide bushing holes; station three fly-cuts the remaining six valve guide bushing holes. Station four fly-cuts six push rod holes, three insert counterbore holes, and three intake throats. Station five completes the fly-cutting of the remaining six push rod holes, three intake throats, and three insert counterbored holes.

One of the new operations on the six-cylinder block is the addition of valve spring seats in the entire valve line and these are spot-faced in a battery of three new Ex-Cell-O machines of special design.

It will be recalled by our readers that Ford pioneered the precision-boring and honing of cylinder blocks in a self-contained and enclosed air-conditioned department to assure standard temperature conditions for these exacting operations. The introduction of this practice on V-8 blocks was described in AUTOMOTIVE INDUSTRIES about 10 years ago. The same principle has been carried out on the Six, the air-conditioned department having been placed in operation about the time this article was written.

Striking feature here is the use of a battery of Ex-Cell-O precision boring machines with angular mounting of spindles. These are 12-spindle machines with a long bed as illustrated. Originally used to rough-bore at one station and finish-bore at the second station to complete one block for each cycle, the machines have been rebuilt to rough- and finish-bore in one operation, thus completing two blocks for each cycle. Following precision boring, the blocks are honed in the familiar six-spindle Barnesdril honing machines.

The foregoing operations are all performed on the line in the foundry machine shop. Additional machine operations and engine assembly handled in the engine building are not covered in this article.

HOLTITE
Engineered Fastenings
Reg. U.S. Pat. Off.

The completely scientific production of HOLTITE screws, bolts and allied fastenings is closely supervised through every operation by our skilled Engineering Staff. From the analysis of raw material to the final hardening, heat-treating and finishing every operation is meticulously checked and inspected by the latest scientific devices. Modern comparators throughout the production line supplement inspection devices to insure absolute precision.

Aided by special research in extensive chemical and metallurgical laboratories, our engineers are constantly improving methods, equipment and products to provide users with the most rugged, uniform and accurate fastenings science can devise.

HOLTITE *Engineered Fastenings* effect tighter, stronger, vibration-defying assemblies with cost-cutting efficiency. Select your next requirements from HOLTITE'S complete line . . . your time study records will prove the wisdom of their continued use.

CONTINENTAL
SCREW CO. New Bedford, Mass., U.S.A.

Materials Handling

(*Continued from page* 46)

moving 2000-lb load through a clearance as low as five ft 10 in. and tiering nine ft high.

Introduce New Devices

The introduction of a number of new devices, designed to handle materials without the aid of pallets, was one of the outstanding features of the Cleveland show. The new MoTowLift, developed by the Service Caster & Truck Corp. is one such device. It is equipped with air-expanding forks which are designed to grip the lower course of stacked cartons, cases, bricks, concrete blocks, etc., and thus enable lifting, transportation and stacking without recourse to pallets. When the air-expanding forks of the new MoTowLift are inserted into the properly stacked material, the operator turns on an air compressor on the truck. Compressed air expands rubber tubes in the tines of the fork until they firmly grip the load.

One of the outstanding attractions at the Towmotor Corp., Cleveland, exhibit was the newest Towmotor fork lift truck accessory, a multiple drum carrier, which was shown publicly for the first time. It handles one to four drums by means of specially-designed, hydraulically-operated gripping shoes. Capable of high stacking drums to utilize overhead storage area, it is also suitable for loading drums into railway cars and motor trucks.

Another pallet-eliminating device is the Pul-Pac, exhibited by the Clark Equipment Co., Battle Creek, Mich. This "push-pull" handling device enables a fork truck to pick up, lift, carry and tier a unit load based on a sheet of corrugated paper, fiber board or similar material either disposable or durable in nature, thus eliminating the need for conventional pallets.

The Pul-Pac consists of a vertical movable rack which travels horizontally above the truck's broad carrying forks. A gripper device at the base of the rack seizes the projecting edge of the carrier sheet or load base and is then retracted, drawing the load onto the forks. At destination the operation is reversed, and as the rack holds the load over the desired position the load carrying-plate is removed from beneath the carrier sheet and the load is deposited. The whole operation is performed hydraulically, using power provided by the hydraulic system that activates the lifting and tilting mechanisms of the truck. Clark also announced a new shovel, equipped with pneumatic snubber to cushion shocks, for use on fork trucks.

Bell Aircraft Corp. has entered the materials handling field with a truck built for a capacity of 1000 lb of dry or wet materials using a platform or bucket, which dump mechanically.

Other recent developments tending to minimize the use of pallets include a brick handling attachment and a new package attachment designed for use with the Hyster 20, manufactured by the Hyster Co., Portland, Ore. Also a new pushing device, developed by the Elwell Parker Electric Co., Cleveland, which retained the pallet in a stacking operation, thus reducing the number required in handling operations.

Offsetting this trend on the part of manufacturers to design mechanized handling equipment and accessories specifically designed to eliminate or minimize the use of pallets in many handling operations, was the marked increase in the number of exhibits featuring inexpensive, collapsible and expendable pallets made of paper, cardboard, metal and wirebound plywood and other materials for minimizing shipping costs and solving the pallet return problem.

Automatic Pallet Loader

The automatic pallet loader, manufactured by Production Aids, Inc., was a source of much interest to visitors. This takes cases or cartons directly from the production line and lock-loads them on pallets, making a complete

(*Turn to page* 84, *please*)

FAIRFIELD

NO MATTER how special your requirements may be, Fairfield can help you solve your gear production problems efficiently . . . and economically. Fine manufacturing facilities, large production capacity, and some twenty-eight years of engineering experience have made Fairfield a leader in supplying gears for tractors, trucks, buses, machine tools, engines, and all kinds of automotive, aviation, agricultural, construction, marine, and industrial equipment. CHECK WITH FAIRFIELD ON YOUR NEXT GEAR REQUIREMENTS.

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GASKETS
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OIL SEALS
GASKET PACKING MATERIALS
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for 42 years
Gaskets of all types and materials
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SINCE 1906 GASKETS
THE COMPLETE LINE THAT COMPLETELY SATISFIES

WHO HE IS—One of the materials handling engineers from the nearest of Elwell-Parker's 34 field headquarters—a specialist with many years' experience in industrial truck systems.

WHAT'S BEHIND HIM—Elwell-Parker's *longer* and *more varied* experience gained by 42 years' service to more than 300 branches of industry.

WHAT HE CAN DO FOR YOU—**1.** Analyze *your* materials handling problem—that is, *your* loads in relation to *your* plant and production system. **2.** Suggest the correct basic containers for your products, and their proper handling in master unit loads. **3.** Recommend an integrated system of Elwell-Parker Trucks, Tractors and Cranes selected from the 47 E-P models, and then have them "tailored" to *your* specific requirements.

To profit by his successful experience, *have us send him so you can start your planning now.* The Elwell-Parker Electric Co., 4533 St. Clair Avenue, Cleveland 14, Ohio.

SCIENTIFIC MATERIALS HANDLING fully explained in free booklet—ask for "Industrial Logistics".

ELWELL-PARKER
POWER INDUSTRIAL TRUCKS
Established 1893

Materials Handling

(*Continued from page* 82)

palletized load, ready to be picked up by fork truck and loaded on truck or railroad car. The loader is completely automatic, and up to 18 stacking arrangements can be made simply by pushing a button. A layer at a time is arranged, then dropped to the pallet while the next layer is arranged. The fully loaded pallet is expelled from the machine on a chain drive, and the next pallet is positioned. The machine has a basic speed of 25 to 30 cartons per minute, depending on the length of the carton.

The first electric lift truck to be equipped with pneumatic tires was the new electric Palletier, exhibited by the Crescent Truck Co., Lebanon, Pa. This new device, which has a capacity of 1000 to 2000 lb, is designed to permit the use of pneumatic tires when maximum floor protection or additional cushioning is required for fragile loads.

In addition to its latest models of industrial trucks, The Yale & Towne Manufacturing Co., Philadelphia, displayed its new line of wire rope hoists, which have been named the Load King. Equipped with specially-designed reversing type motors, they will be available in one-quarter, one-half and one-ton capacities.

Bell Aircraft Corp. has entered the materials handling field with a truck built for a capacity of 1000 lb of dry or wet materials using a platform or bucket, which dump mechanically. Ironbound Box and Lumber Co. displayed its new RolTruk for lifting and moving heavy cylindrical objects.

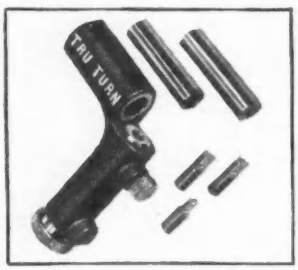
Metal Turning Made Easy with New Simplified Tool!

A new tool called "Tru-Turn" makes possible the conversion of drill presses, woodturning lathes, or grinder stands into tools that will turn and cut-off steel, bronze, copper and aluminum. The "Tru-Turn" tool shown above is mounted on a Buffalo Drill Press, Spindle Size.

The "Tru-Turn" tool is easy to operate and cuts and turns bar stock of steel, bronze, copper and aluminum measuring ¼", ⅜" and ½". Its built-in micrometer permits adjustments that give tool-room accuracy to 1/1000 inch.

Small tool shops as well as all types of repair shops and garages find the "Tru-Turn" ideal for cutting long pieces of bar stock into desired lengths. Also, home craftsmen are able to produce accurate, highly finished precisioned-machined parts from metal even without previous training.

Accurate, precision work is also easier to do when tension is relieved by chewing gum. The act of chewing gum seems to make the work go easier, faster—thus helping on-the-job efficiency. For these reasons Wrigley's Spearmint Chewing Gum is being made available more and more by plant owners everywhere.



Tru-Turn Tool

You can get complete information from Millholland Screw Products Corp., 132 West 13th Street Indianapolis 2, Ind.

AC-55

Engine Oil Consumption

(*Continued from page* 35)

making a specified test run of several hours and then draining and weighing the remainder. This method, however, gives only total consumption for the run and gives no indication of added weight by initial dilution.

More reliable results have been obtained by arranging an external system of a supplementary oil reservoir, set on a suitable scale, and flexibly connected to the engine so as to maintain a fixed level in the oil pan by a float valve and gravity feed from the reservoir. Periodic readings of the scale will indicate the weight of the oil being added, or inversely, oil consumption. We still fail by this method to obtain an indication of dilution.

The dry-sump method commonly used in the aircraft industry is satisfactory for installations where relatively large quantities of oil are consumed. This method is unsatisfactory for automobile applications because of the gulping action of the relatively large scavenge pump which is required.

The dry-sump method is an elaboration of the use of an external reservoir which is set on a scale and makes use of engine-driven supply and scavenging pumps, a supplementary reservoir, a filter, and an appropriate heat exchanger to stabilize temperature conditions. Periodic readings of the scale are plotted on a graph against time, establishing a pounds-per-hour rate. This method will indicate any appreciable dilution as a negative consumption. Installation has to be carefully engineered, otherwise erroneous readings will be recorded, due to entrapped air in the system, or to a sudden change in rate which will not be readily detected.

Improved Weighing Unit Developed

Karl H. Effmann, research engineer for The Perfect Circle Co., having used the foregoing methods, came to the conclusion that none of them was completely satisfactory. Thousands of hours a year of dynamometer time are involved in the development and testing of piston rings at Perfect Circle.

(*Turn to page* 88, *please*)

motor range

HERE'S WHERE TO USE IT!

Textile
Slashers
Knitting machines
Individual finishing machines
Spinning frames
Printing machines

Chemical
Shakers
Grinders
Pulverizers
Mixers
Liquid pumps
Solids pumps

Metal-Working
Drawbenches
Lathes
Stamping presses
Milling machines
Grinders

Printing
Job presses
Coating machines
Trimming machines
Stitching machines
Rotary web presses

Food
Ovens
Proofers
Mixers
Fillers
Labelers
Grinders
Centrifugals
Conveyors
Shaker Screens
Pumps
Blanchers

Paper
Winders
Slitters
Supercalenders
Coating machines
Waxing machines
Embossers
Other converting machinery
Stock preparation machinery
Conveyors

Non-Ferrous & Rock Products
Mill feeder drives
Crusher feeder drives
Sinter conveyors
Other conveyors

Yes – you can now get a simple a-c motor and stepless speed adjustment over a 3 to 1 range *in a single, compact enclosure!* At the twist of a dial, the new Tri-Clad Type ACA induction motor changes speed quickly and accurately without *any power converting equipment.* Practically no different looking than any other induction motor, the Type ACA is a simple, economical way to equip old and new machines with an adjustable-speed drive and still retain the advantages of a-c motor operation.

Constant torque at any speed!

This new Tri-Clad motor provides constant torque over the entire 3 to 1 speed range and *holds* its speed despite load changes. Its efficiency and power factor are high at any speed – an important advantage where long operation over most of the speed range is customary. And for EXTRA PROTECTION against physical damage, electrical breakdown, and operating wear and tear, it features sturdy Tri-Clad design and construction.

Up to 50 hp available!

The Tri-Clad Type ACA induction motor with 3 to 1 speed adjustment is now available in ratings from 3 to 50 hp. Standard NEMA dimensions are used. For remote control, a flexible cable or pilot motor are available. Write today for Bulletin GEA-4883. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

You can't beat Tri-Clad Extra Protection!

GENERAL ELECTRIC COMPANY, Section 750-292F
Apparatus Department, Schenectady 5, N. Y.

Please send me Bulletin GEA-4883 which describes the new Tri-Clad Type ACA motor:

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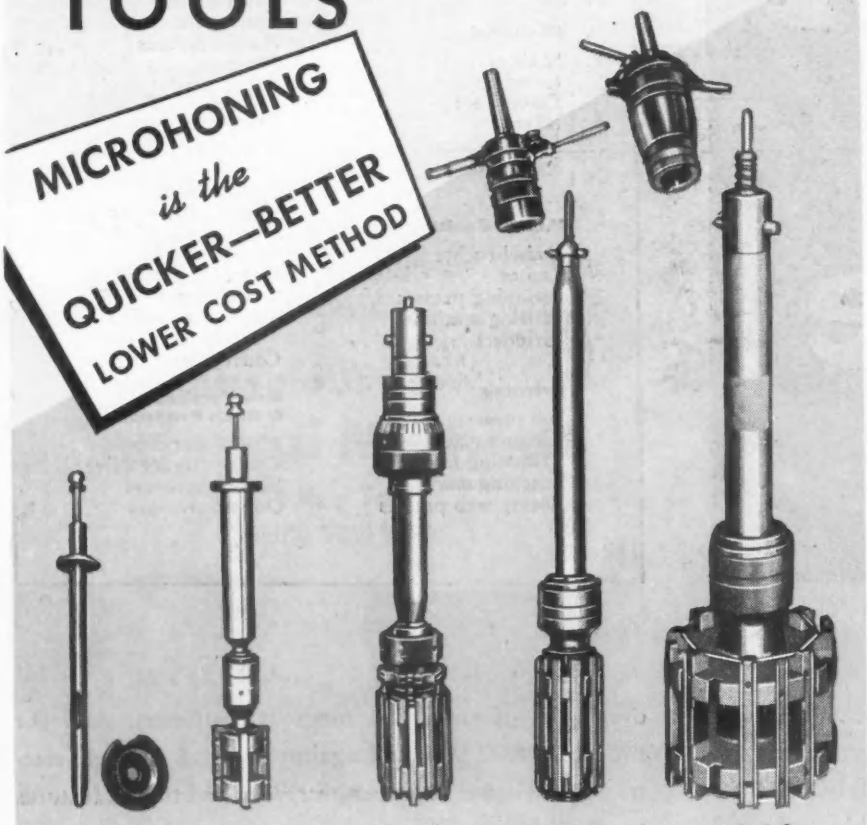
For Round and Straight Bores Uniformly Sized and Finished

MICROHONING* TOOLS

MICROHONING *is the* QUICKER—BETTER LOWER COST METHOD



Micromold* Tool and Microsize* Ring | General Purpose Microhoning Tools | Hydraulic Tools | Brake-Type Tools and Adjusting Head | Hydrobrake* Tools with Adjusting Head

MICROMATIC MICROHONING TOOLS

in the range of bore diameter sizes from ¼″ to 42″, and up to 75 feet long, correct error and generate final roundness and straightness within limits of .0001″ to .0003″, either by AUTOMATIC or operator control—remove up to .080″ stock at rates up to .012″ per minute on diameter—and any desired type of surface finish. They are designed and constructed to meet the needs of economical precision production. We can mail further information.

*Trademark Reg. U.S. Patent Office.

MICROMATIC HONE CORPORATION

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Los Angeles, Calif. • Houston, Texas • Rockford, Ill. • Guilford, Conn. • Brantford, Ont., Can.

Engine Oil Consumption

(*Continued from page* 84)

The ability to correlate and repeat oil consumption tests is of extreme importance. The initial goal was for a method of continuously weighing oil, while an engine was running, to permit speedy detection of a change in consumption. Many valuable hours of dynamometer stand time can be saved by detection of such a change early in a run. Automatic plotting of consumption against time while reliably controlling temperature in a circulating system was next considered by Mr. Effmann, who developed a recording scale and controlled circulatory system which gave a reliable and accurate method of oil consumption determination.

The recording scale device, which was developed originally, consisted of a beam-type scale with an oil reservoir, mounted on knife edges a fixed distance from the fulcrum on one end of the beam, and a motor driven poise free to travel the length of the opposite leg of the beam. A pair of contact points, mounted on the end of the poise-leg of the beam, actuated the poise-drive motor in a direction necessary to keep the scale in balance with the oil reservoir. A strip chart drive mechanism of a width necessary for the total poise travel, together with an inking pen, was positioned below the traveling poise. Weight changes in the reservoir were reflected as a line on the chart.

When applied to automobile type engines the external oil circulating system connected to the scale consisted of a scavenging pump which maintained a constant level in the oil pan, and a return pump which supplied oil to the engine from the reservoir, and provided a balance line between the reservoir and the engine.

In obtaining oil temperature control the oil in the pan was recirculated by a separate pump and through a heat exchanger with a by-pass. The flow was proportioned through the heat exchanger or by-pass by a Brown three-way mix. The motorized value was controlled by a Minneapolis-Honeywell bulb-type temperature controller. A variation on this general system was used on dry-sump engines.

This latter method, proving to be accurate and reliable, created a demand for the recording scale among other groups interested in this type of work. Although Perfect Circle had built several units for use in their own laboratories, the making of such apparatus was beyond their normal scope of business. For that reason arrangements were made with the Laboratory Equipment Corp. for manufacturing the equipment.

(*Turn to page* 90, *please*)

Is Adaptable... Easy to Design into a Product

Felt comes in a wide range of densities, thicknesses, qualities . . . can be processed to almost any consistency, from downy softness to the hardness of seasoned maple board.

Designers and engineers find felt valuable for its many other features, too: cuts with a clean, non-fray edge . . . retains high resiliency for a long time under tough conditions . . . high breaking point . . . not hurt by normal atmospheric conditions . . . can be used freely in presence of gasoline and oil . . . deadens noise . . . built for budgets as well as blueprints.

Get full details now from The Felters Company. And for sure, quick ordering ask for your free copy of Felters Precision Cut Felt Parts Manual — it will save you many precious minutes every time you order cut felt parts.

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Offices: New York, Philadelphia, Chicago, Detroit
Sales Representatives: San Francisco, St. Louis

Makes the Felt for the Parts it Cuts

Engine Oil Consumption

(*Continued from page* 88)

A survey of potential users of the equipment indicated it would be desirable to have the recording portion of the scale separate. This required that a means of transmitting the information from the scale to the recording instrument had to be developed as well as an automatic means for retrimming the scale at the end of each poise travel. The unit was completely redesigned with these objectives in mind. The basic operation of the scale is identical with the original Perfect Circle units.

Electronic Weight Recorder

A Brown electronic strip chart recorder was employed to obtain the remote recording feature. Synchronized actuation of the pen by a remote positioner unit was incorporated in the scale proper. The position of this unit is determined by the relation of the motor-driven poise to the scale fulcrum, both being positioned by the same drive cable. As 10 inches of travel of the poise along the scale beam is equivalent to the poise increment, which can be one, two, five or 10 lb, 10 in. of chart is also equal to this value. This allows a portion of the left side of the chart for indicating initial dilution or negative consumption when starting from zero position.

It being unnecessary for a test cell operator to be near the scale, an automatic compensating device was incorporated. This feature also makes it unnecessary to manually rebalance the scale when a weight of oil has been consumed which is equivalent to the poise. Instead a relatively large weight is suspended on a track below the poise. As the poise reaches the end of its travel a sensitive switch is closed energizing a solenoid which allows the compensating weight to move a distance equivalent to the value of poise-weight, thus returning the poise and recorder pen to zero, which permits the scale to automatically cycle until the reservoir has been emptied.

The oil consumption scale and its circulating system operate automatically. The operator obtains a continuous record of rate of oil consumption and total consumption by referring to the recording instrument on his control panel. This arrangement serves two important purposes. It gives a speedy indication of any change in rate of consumption, to the hundredth of a pound. This section of the chart becomes a permanent record of the particular run and is always available for correlation or comparative purposes with subsequent tests.

Another advantage of this method for determining engine oil consumption is that it is possible to obtain accurate and permanent records of oil consumption rate trends with dynamometer runs of relatively short duration, saving valuable time in routine and screening work with an engine and/or its component parts.

The Best Combination
for FINE ENGINE PERFORMANCE

Johnson ADJUSTABLE TAPPETS
and the
Johnson SELF-LOCKING TAPPET SCREW

The Johnson Self-Locking Tappet Screw is made from the finest Steel, accurately heat treated to give it toughness and long life. The flexible spring action of the diaphragm holds the threads fully and rigidly seated at all times. The entire load is carried by the solid portion of the screw.

The Johnson Self-Locking Tappet Screw has no leading edges and is not self-tapping. Effectiveness is maintained through any number of adjustments.

Write today for the latest Johnson TAPPET BULLETIN.

Johnson PRODUCTS INC.
MUSKEGON, MICHIGAN
"Tappets Are Our Business"

General News

(*Continued from page* 23)

Bell Aircraft Diversifies with Powered Barrow

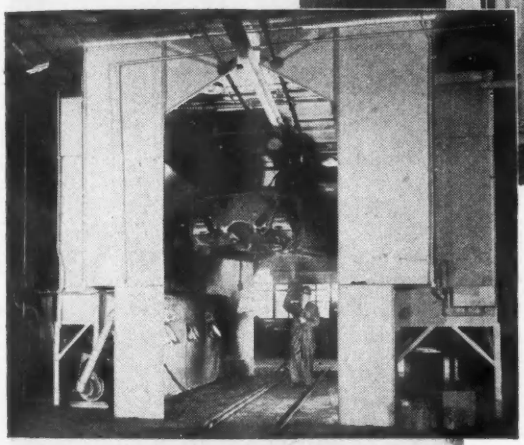
The Bell Aircraft Corp. has announced another part of its diversification program: an engine-driven, three-wheeled wheelbarrow, called the Prime Mover. Powered by a small, three-hp gasoline engine, and measuring about three ft in height, three ft in width, and six ft in length, the Prime Mover can carry 1000 lb up a 20 per cent grade. It can be used as a handtruck by taking off the bucket and putting on a platform, and it can be employed also as a snowplow or small bulldozer. Production is scheduled to start Feb. 1, and the price will be $500.

(*Turn to page* 92, *please*)

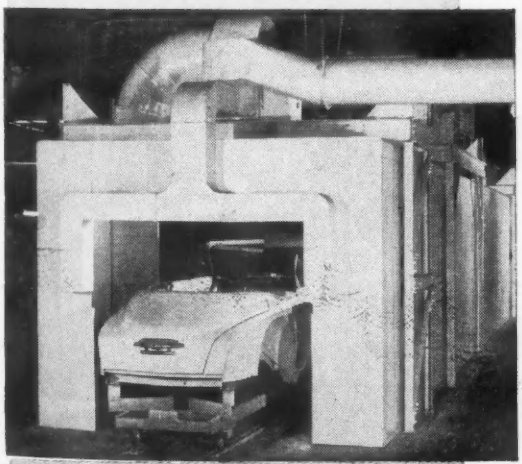
COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT

Above: Typical Mahon Filtered Supply Unit which Supplies Clean, Tempered Air to Spray Rooms of Mahon Finishing Systems at Studebaker. At Right: Mahon Hydro-Filter Spray Booths Installed in Production Line for Applying the Fine Finish to Studebaker Convertible Bodies.



Mahon Hydro-Filter Spray Booth for Painting the Underside of Studebaker Convertible Bodies.



Typical Mahon Tunnel-Type Drying Oven—Part of the New Studebaker Installation.

. . . Modern Equipment Produces FINER FINISH at LOWER UNIT COST

Just as the new 1948 Studebaker Convertibles receive their matchless finish in Mahon Finishing Equipment, so do many other automobiles produced in the United States, Canada and throughout the world. In the household appliance field too—where fine finishes are imperative—you will find that Mahon equipment predominates. This is significant. Significant too, is the fact that one automobile manufacturer now has one hundred and three Mahon Finishing Systems in various plants throughout the United States, Canada, England, France, Belgium, Egypt, South Africa, Australia, Mexico, Venezuela, Brazil and Argentina . . . another large manufacturer has fifteen Mahon Finishing Systems in plants through the middle west from Pittsburgh to Milwaukee. Manufacturers today, turn naturally to Mahon for equipment to produce the finest finishes . . . they do so because they know that twenty-seven years of constant research and pioneering development, in this highly specialized field, have endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available elsewhere. See Mahon Insert in Sweet's Mechanical Industries File for complete information or arrange consultation with Mahon engineers.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 11, Michigan • WESTERN SALES DIVISION, Chicago 4, Illinois

Engineers and Manufacturers of Complete Finishing Systems including: Metal Cleaning Machines, Rust Proofing Machines, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Units, and Drying and Baking Ovens. Also Paint Reclaiming Units, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

MAHON

General News

(*Continued from page* 90)

British Reversible Trailer Hauls 50 Tons

With a gross weight of about 75 tons, and capable of hauling loads up to 50 tons, a new 16-wheeled trailer which can be towed in either direction, and which can be moved broadside, has been built for the New Zealand government by R. A. Dyson and Co., Ltd., Liverpool, England. Including the two eight-wheeled carriages, the trailer overall measures 49 ft, 3 in. by 9 ft. The well platform measures 21 ft, 8.5 in. by 8 ft.

Willys Raises Prices of Jeeps from $1146 to $1195

Increased costs have necessitated an increase in the factory list price of its jeeps from $1146 to $1195, according to Willys-Overland Motors, Inc.

AC Spark Plug Damps Instruments With Silicone Fluid

Culminating a program of research extending about two years, GM's AC Spark Plug Div. announced the adoption of Silicone fluid as a means of damping passenger car instruments. All instruments now in production—speedometers, ammeters, gasoline gages—have a minute amount of Silicone fluid applied on the needle pivot shaft. Damping effect is particularly impressive in connection with the operation of gas gages and ammeters.

National Screw & Mfg. Co. Buys Chester Hoist

The National Screw & Mfg. Co., Cleveland, O., has purchased the Chester Hoist Co. of Lisbon, O. The Lisbon plant will be known as the Chester Hoist Div. of The National Screw & Mfg. Co.

New JOV-3 Helicopter Employs Tandem Rotors

The helicopter family continues to grow with the announcement of the JOV-3, a development of the Helicopter Engineering Research Corp. of Philadelphia, which is equipped with two rotors, 18 ft, 6 in. in diam, operating in tamden at high speed. Powered by a four-cyl, 100-hp, 0-235 Lycoming engine, the JOV-3 has a gross weight of 1200 lb, an empty weight of 777 lb, and an useful load of 423 lb. The new helicopter measures 26 ft, 4 in. in overall length; 9 ft, 3 in. in overall height, and 17 ft in width. Based on moderate production, a price tag of $8500 is expected, with a reduction to approximately $6000 for quantity production.

Ford Using Hot Extrusion to Forge Spindles

Ford Motor Co. has adopted and will use in its Canton, O. forging unit a method of producing front wheel spindles by a hot extrusion method, it is reported. The new spindles are said to be about 50 per cent stronger than the forged spindles in fatigue.

Newcomb-Detroit Acquires Grand Rapids Div.

Newcomb-Detroit Co. of Detroit has acquired the Newcomb Engineering Co. of Grand Rapids, Mich., and will operate it as a separate division. Richard W. Wenzel, former GMC Truck & Coach engineer has been named manager of the Grand Rapids plant.

Elect J. H. Doolittle Fellow of Aeronautical Institute

James H. Doolittle, vice-president and a director of Shell Union Oil Corp., and a past president and fellow of the Institute of the Aeronautical Sciences, was recently elected an honorary fellow of the Institute.

Ohio Crankshaft Co. Purchases Induction Heating Div.

The Induction Heating Div. of the Budd Co. in Detroit has been purchased by the Ohio Crankshaft Co. for its Tocco Div. The purchase included machinery, equipment, inventories, and patents, but not the land or the buildings.

Tucker Gets Jacobs Aircraft For Consultant Work

Tucker Corp. has retained Jacobs Aircraft Engine Co. of Pottstown, Pa., on a consulting basis. The company will conduct a development and research program for Tucker, and its work will be coordinated with Tucker engineering projects already under way in Chicago and other cities, according to Fred Rockelman, executive vice president.

Lincoln-Mercury Advertising to Kenyon & Eckhardt

Ford Motor Co.'s Lincoln-Mercury Div. has appointed Kenyon & Eckhardt, Inc., to handle Lincoln and Mercury advertising. The move is a further step in the company's program of divorcing Lincoln-Mercury operations from those of Ford passenger cars and trucks.

The Ford Motor Co. has announced that Robert F. G. Copeland, formerly in charge of Batten, Barton, Durstine & Osborn's Detroit office, has been ap-

(*Turn to page* 96, *please*)

★ At greater Man-Hour SAVINGS
★ At higher rated EFFICIENCY
★ At finer, effortless PRECISION

A Moline Multiple Spindle Specially Designed Machine Tool can do your job better at less cost. Ruggedly built to fit your INDIVIDUAL requirements in such operations as Boring — Straight Line Drilling — Universal Adjustable Spindle Drilling — Honing — Tapping — Reaming — Counterboring — Special Milling — these machines are based on years of experience accumulated since 1901.

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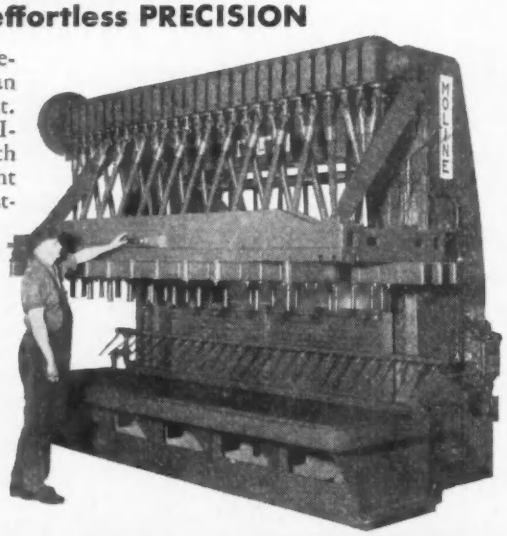

No. HU68
DRILLER

MOLINE TOOL CO.
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MOLINE TOOL COMPANY
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● **RECENTLY** installed 800-ton semi-automatic, push button operated Lake Erie Hydraulic Press in place in the Divco Corporation plant in Detroit. This press is a four column, self-contained, double action unit with clamping and draw platens. The platens measure 160" left to right, distance front to back between columns is 94" and stroke is 52".

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Booth
TRADE MARK
PRECISION CUT FELT PARTS

General News

(*Continued from page 92*)

pointed advertising and sales promotion manager of the Lincoln-Mercury Div.

Firestone Buys WAA Plant in Des Moines, Iowa

Firestone Tire & Rubber Co. has bought a wartime rubber plant in Des Moines, Iowa, for $3,425,000, according to an announcement by the WAA. Producing heavy duty tires for military use, Firestone operated the plant, which has about 245,265 sq ft of floor space, during the war.

Obituary

Allen F. Edwards

Allen F. Edwards, 71, member of the board of the Chrysler Corp., and president of Universal Products Co., Inc., died Jan. 13 at Grosse Point Farms, Mich.

James Edwin Morrow

James Edwin Morrow, 68, former vice-president and general manager of Willys Overland Automobile Co., and WAA official, died on Jan. 13 in Dunedin, Fla.

Jesse Mercer White

Jesse Mercer White, 64, president, J. M. White, Inc., (manufacturers of insulated wire, assemblies, and terminals in Philadelphia) and designer and builder of the Triplex racer, which in 1928 set a world's automobile speed record, died on Jan. 9 in Merion, Pa.

Reginald K. Pierson

Reginald K. Pierson, 56, pioneer English airplane designer for Vickers-Armstrongs, Ltd., and designer of the Wellington bomber, died on Jan. 10 in Cranleigh, Surrey, England.

Classified Advertisements

MANUFACTURER'S AGENT in New England, with twenty years' experience, of high character and ability, with a personal acquaintance of executives in the Automotive and Hardware Jobber trade, is available, together with a Junior salesman, to represent and sell quality merchandise in New England on full time solicitation. Box 96, Automotive Industries, 5601 Chestnut St., Philadelphia 39, Pa.

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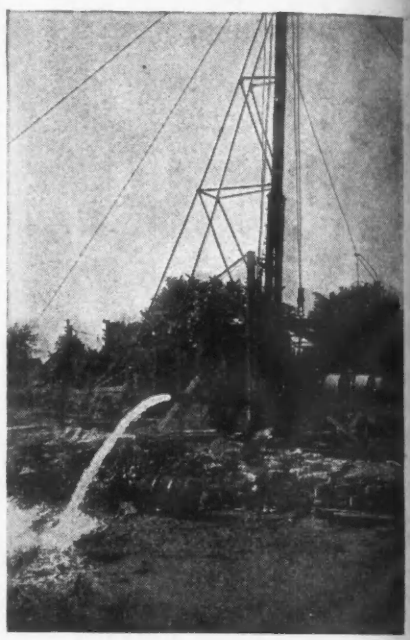

CITY OF ROLLA, MO.

The picturesque and progressive city of Rolla, Missouri, has assured itself of much greater residential, business and industrial growth by adding the fourth Layne Well Water Supply unit, to step their daily water capacity up to 2,500,000 gallons. In purchasing these carefully designed and precision built wells and pumps, the city has made an excellent financial investment. Operating at an unusually low cost, their Water System will show a substantial annual profit. Furthermore, their Layne Wells and Pumps will probably need only very minor repairs for years and years. Layne Well Water Supply Systems, whether installed for cities, factories, railroads, chemical plants, refineries or irrigation projects, can be depended on to give outstanding satisfaction. For further facts, address LAYNE & BOWLER, INC., General Offices, Memphis 8, Tennessee.

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